The Technical Manual:
UNO-2.0/2.5-I-OUTD-X-US

POWER-ONE TRADEMARKS:

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Contents

1 FOREWORD

1.1 Conditions of warranty and supply

Warranty conditions are described in a certificate supplied with the equipment. The warranty conditions are understood to be valid if the Client observes what is described in this manual. Any conditions deviating from those described below must be explicitly agreed upon in the purchase order.

1.2 Exclusions

It is absolutely prohibited to make modifications to the equipment. The Customer is entirely responsible for any modifications made to the system.
Power-One declines any responsibility in case standards for correct installation are not adhered to and it is not liable for systems upstream or downstream of the equipment it has supplied.

Check for adequate spaces, adapted to accept the unit, air noise produced as a function of the environment, any conditions of flammability as installations can vary.

Power-One CANNOT be held responsible for lack of production even if it results from break-downs of the unit, or the data communication system.

Power-One CANNOT be held responsible for defects or malfunctions as a result of: improper use of the tool; alterations due to transportation or special environmental conditions; lack of/ or improper maintenance; tampering, poor installation repairs or use.

Power-One CANNOT be held responsible for disposal of: displays, cables, batteries, accumulators etc. It is necessary that the user(s) dispose of such substances that are potentially harmful to the environment in accordance to the standards enforced in the country of installation.

PART 1: INTRODUCTION & SAFETY

2 INTRODUCTION

THE INSTALLER MUST READ THIS DOCUMENT IN ITS ENTIRETY BEFORE INSTALLING OR COMMISSIONING THIS EQUIPMENT

KEEP THESE INSTRUCTIONS

IMPORTANT SAFETY INSTRUCTIONS

2.1 PURPOSE

The purpose of this document is to support the qualified technician, who has received training and/or has demonstrated skills and knowledge in construction to install and maintain this Power-One AURORA®Photovoltaic (PV) Inverter. This manual does not cover any details concerning equipment connected to the inverter such as the solar modules. Information concerning the connected equipment is available from the respective manufacturer.

This manual is a guide that will enable installers to work safely and carry out the operations necessary for keeping the equipment in good working order.

2.2 TARGET AUDIENCE

The installation is to be done by a qualified installer and/or licensed electrician or contractor who knows and understands the National Electric Code and according to the applicable local code regulations (National Electric Code, Canada Electric Code wiring rules and others)

The customer must make sure the operator has the necessary skill and training to do his/her job. Technician in charge of using and maintaining the equipment must be licensed and qualified for the described tasks and must have the experience to correctly interpret what is described in the manual.

For safety reasons only a qualified electrician, who has received training and/or has demonstrated skills and knowledge in construction and in operation of this unit, can install this inverter.

2.3 VALIDITY AND AVAILABLE VERSIONS

Table1: Part Number Coding Information										
Product Series		**Output Power**		**Isolation Type**		**US**		**OUTD**		**Use Location**
UNO	**-**	**2.0**	**-**	**I**		**S**	**-**		**-**	**US**
UNO => Aurora PV Inverter Platform		**2.0** => 2.0kW **2.5** => 2.5kW		**I**=> With a High-Frequency Isolated Output		[empty]= No Switchbox [**S**]= With Integral DC Disconnect Switch		OUTDOOR use only		**US**=> Designed for North America
The UNO product is an engineered product for most applications and requires extensive documentation for complete specification. Please discuss needs with Power-One Technical Support.										

There are two versions of the UNO, delineated by the maximum output power (2.0 kW or 2.5 kW).

For inverters of equal output power the variant between the models is the presence or lack thereof of the DC disconnect switch.

• **2.0 kW MODELS**	***UNO-2.0-I-US*** WEIGHT: 42.5lb/ 19.3kg DIMENTIONS: 30.3 x 14.4 x6.3 in/ 769 x 367 x 161mm	UNO-2.0-I-OUTD-US: Standard version Without DC Switch and Wiring Box UNO-2.0-I-OUTD- S -US-: With DC Switch and Wiring Box
• **2.5 kW MODELS**	***UNO-2.5-I-US*** WEIGHT: 42.5lb/19.3kg DIMENTIONS: 30.3 x 14.4 x 6.3 / 769 x 367 x 161	UNO-2.5-I-OUTD-US: Standard Version Without DC Switch and Wiring Box UNO-2.5-I-OUTD- S -US-: With DC Switch and Wiring Box

2.4 NAMEPLATE

	***The nameplate attached to the equipment must absolutely NOT be removed, damaged, stained, hidden, etc. They are not to be hidden with external objects or parts such as rags, boxes, or other such equipment. They should be cleaned periodically and always maintained in view.***

The nameplate shown below is affixed to the inverter and provides the following information:
1) Manufacturer code
2) Model code
3) Serial number
4) Week/Year of production

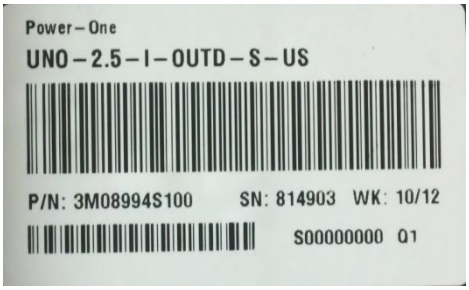
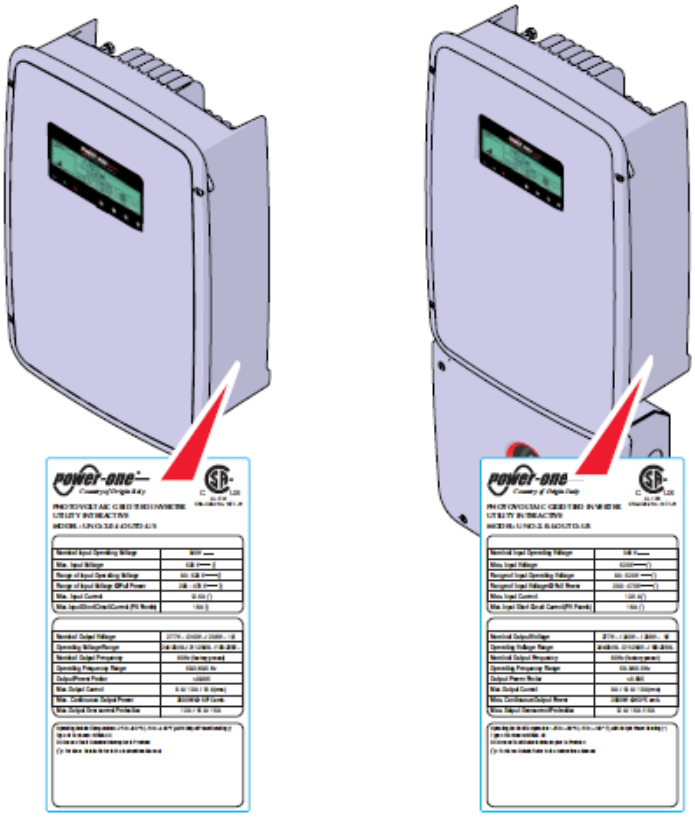
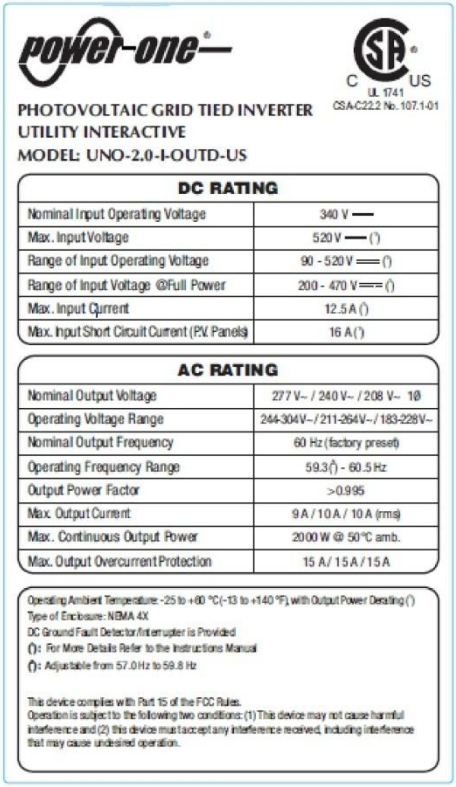


Figure 1.0: Nameplate UNO-2.5-I-OUTD-S-US

Technical data reported in this manual; however, does not substitute the data mentioned on the labels affixed to the equipment.





power-one®

C SP US
UL 1741
CSA-C22.2 No.107.1-01

PHOTOVOLTAIC GRID TIED INVERTER
UTILITY INTERACTIVE
MODEL: UNO-2.0-I-OUTD-US

DC RATING	
Nominal Input Operating Voltage	340 V ⎓
Max. Input Voltage	520 V ⎓ (*)
Range of Input Operating Voltage	90 - 520 V ⎓ (*)
Range of Input Voltage @Full Power	200 - 470 V ⎓ (*)
Max. Input Current	12.5 A (*)
Max. Input Short Circuit Current (P.V. Panels)	16 A (*)

AC RATING	
Nominal Output Voltage	277 V~ / 240 V~ / 208 V~ 1Ø
Operating Voltage Range	244-304V~ / 211-264V~ / 183-228V~
Nominal Output Frequency	60 Hz (factory preset)
Operating Frequency Range	59.3(*) - 60.5 Hz
Output Power Factor	>0.995
Max. Output Current	9 A / 10 A / 10 A (rms)
Max. Continuous Output Power	2000 W @ 50 °C amb.
Max. Output Overcurrent Protection	15 A / 15 A / 15 A

Operating Ambient Temperature: -25 to +60 °C (-13 to +140 °F) with Output Power Derating (*)
Type of Enclosure: NEMA 4X
DC Ground Fault Detector/Interrupter is Provided
(*): For More Details Refer to the Instructions Manual
(*): Adjustable from 57.0 Hz to 59.8 Hz

This device complies with Part 15 of the FCC Rules.
Operation is subject to the following two conditions: (1) This device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

Figure 1.1: Label affixed to the inverter

2.5 Warranty Information

After inspecting the AURORA UNO Inverter, it is necessary to fill out the warranty information on this unit and submit it to Power-One. Submitting this information will register the unit with the manufacturer and the owner will receive technical updates regarding this Power-One photovoltaic inverter.

2.6 COMMISSIONING

As part of the commissioning process, double check the following:

- Make sure that there is no ground fault.
- Double check the voltage doesn't exceed specified voltage ratings.
- See Part 4 on Operations for more information on commissioning and start-up.
- Power- One provides commissioning as an additional service offering. Please contact Power-One Customer Service for more information at 1-877-261-1374 .

2.7 MAINTENANCE AND SERVICE

The AURORA Inverter has no user-serviceable parts. Maintenance and service procedures must comply with the manufacturer's documentation. For more detailed information, please see Part 6: Maintenance. Call Power-One Customer Service at 877-261-1374 for a list of qualified service contractors.

2.8 FIGURES AND IMAGES IN THIS MANUAL

The photos in this manual may differ slightly from the final model shipped and the color of the components may not match those illustrated; however, the information is still applicable.

2.9 STORAGE OF THIS INFORMATION

Keep this document in a safe place near the AURORA Inverter for easy access during installation and maintenance.

2.10 ADDITIONAL INFORMATION

3 SAFETY

3.1 WARNINGS IN THIS DOCUMENT

This is a list of special safety symbols used in this manual that highlights potential safety risks and/or useful information. These symbols are as follows:

Symbol	Usage
 **DANGER:**	Indicates a hazardous situation that if not avoided can result in deadly electric shock hazards, other serious physical injury, and/or fire hazards.
 **WARNING:**	Indicates directions which must be fully understood and followed in its entirety in order to avoid potential safety hazards including equipment damage, or personal injury.
 **CAUTION:**	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
 **ATTENTION:**	This points out that the examined area must not be entered or that the described operation must not be carried out. The reader should stop, use caution and fully understand the operations explained before proceeding.
 **NOTE**:	Contains actions and instructions that must be followed in order to avoid potential damage to the equipment and/or faults.
 **INFORMATION**:	Accompanies notes that call attention to supplementary information that ensure optimal operation of the system.
	Indicates that the customer must make sure the operator has the necessary skill and training to do his/her job. Technician in charge of using and maintaining the equipment must be licensed and qualified for the described tasks and must have the experience to correctly interpret what is described in the manual.
	Do NOT install this equipment while under the influence of drugs, narcotics; or with health related issues that might impact mental or physical ability to operate at sound mind. The employment of a person, who is NOT qualified, is, drunk or on narcotics, has a prosthetic mitral valve or a pacemaker is strictly forbidden.
	When operating this equipment, always use Personal Protective Equipment (PPE) recommended by the law and supplied by the employer. The customer is civilly liable for the qualification and mental or physical condition of the professional figures that interact with the equipment. They must always use the PPE enforced by the laws of the country of destination and whatever is provided by their employer.


This symbol indicates a system earth conductor (main grounding protective earth, PE)


This symbol indicates an Alternating Current (AC) Value


This symbol indicates an Direct Current (DC) Value

Ø This symbol indicates Phase


This symbol indicates Grounding (earth)

3.2 EQUIPMENT LABELS

The equipment has various labels. Those with a yellow background refer to safety concerns. Be sure to read all labels before beginning installation of the equipment. If any questions arise as to the meaning or intent of these notices, please contact Power-One Technical Support at 877-261-1374. The descriptions of the symbols used are as follows:


WARNING

DANGEROUS VOLTAGE
The product works with high voltages. All work done on the AURORA Inverter must follow the described documentation and must comply with all prevailing codes and regulations associated with high voltages. During inverter operation, parts will be energized at voltage levels.


WARNING

HOT TEMPERATURE
Some surfaces may become hot. Do not touch the product while it is in operation.

UL 1741 Standard for Safety for Inverters, Converters, Controllers and Interconnection System Equipment for use with Distributed Energy Resources. CSA CSA-C22.2 No. 107.1-01 - General Use Power Supplies. Rule Part 15, Subpart B - Unintentional Radiators Class B Limits

3.3 GENERAL INSTALLATION WARNINGS


WARNING:

- The AURORA Inverter is designed and tested according to international safety requirements; however, certain safety precautions must be observed when installing and operating this inverter. Read and follow all instructions, cautions and warnings in this installation manual. If questions arise, please contact Power-One's Technical Services at 877-261-1374.
- All operations regarding transport, installation and start-up, including maintenance must be carried out by qualified, trained personnel and in compliance with all prevailing local codes and regulations.

- Normal operation of this grid-tied inverter system is possible only when properly connected to an appropriate AC distribution network (grid). Before connecting the AURORA inverter to the local distribution grid, approval from the grid operator and any local authority having jurisdiction is required. Installation and connection of the inverter must be done by qualified technical personnel.

- The Power-One AURORA Inverter is designed and tested according to international safety requirements (Ul 1741/IEEE 1547), but as with all electrical and electronic equipment, certain precautions must be observed and followed during installation.

- Keep this documentation in the immediate vicinity of the AURORA Inverter. It must be accessible for approved technical service and maintenance personal at any time.

- Basic safety rules require using qualified and trained personnel possessing the skills necessary for assembly, mounting, start-up and operation of the product.
- The Aurora Inverter should be connected only to a dedicated branch circuit.

3.4 ASSEMBLY WARNINGS

WARNING:

- Prior to installation, inspect the unit to ensure absence of any transport or handling damage; which could affect insulation integrity or safety clearances. Failure to do so could result in safety hazards.

- Assemble the inverter per the instructions in this manual. Use care when choosing installation location and adhere to specified cooling requirements.

- Unauthorized removal of necessary protections, improper use, incorrect installation and operation may lead to serious safety and shock hazards and/or equipment damage.

3.5 ELECTRICAL CONNECTION WARNINGS

WARNING:

- Make all electrical connections (e.g. conductor termination, fuses, PE connection, etc.) in accordance with prevailing regulations. When working with the inverter powered ON, adhere to all prevailing safety regulations to minimize risk of accidents.

- Systems with inverters typically require additional control (e.g., switches, disconnects) or protective devices (e.g., fusing circuit breakers) depending upon the prevailing safety rules.

- AC output (neutral) is not bonded to ground.

- The standard models of this inverter don't have an integrated DC switch, it must be externally provided by the installer.

- To reduce the risk of fire, connect only to a circuit provided with 15A maximum branch circuit overcurrent protection for UNO-2.0 and UNO-2.5 in accordance with the National Electrical Code.
- On the AC output side an automatic magnetothermic switch should be inserted bertween the Aurora Inverter and the distribution grid.
- The Aurora Inverter should be connected to a dedicated branch circuit.

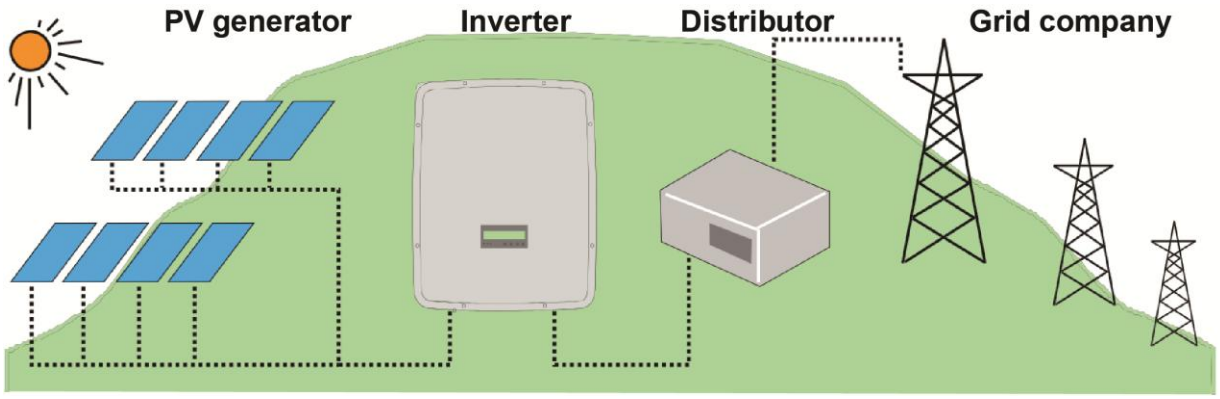
3.6 Operation Warnings

WARNING:

- Anytime the inverter has been disconnected from the power network, use extreme caution as some components can retain charge sufficient to create a shock hazard; to minimize occurrence of such conditions, comply with all corresponding safety symbols and markings present on the unit and in this manual.
- Ensure all covers and doors are closed and secure during operation.
- All operations regarding transport, installation and start-up, including maintenance must be done by qualified, trained personnel and in compliance with all prevailing codes and regulations.

3.7 Appropriate Usage

The AURORA Inverter is a multi-string inverter that converts direct electric current from a photovoltaic generator into alternating electric current and feeds it into the power distribution grid. This AURORA Inverter is suitable for outdoor installation.



3.8 Field Of Use, General Conditions

Power-One accepts no liability for damage of any kind that may arise from incorrect or careless operations.

The equipment must not be used in ways that do not fall within the intended field of use. The equipment MUST be used ONLY by experienced, licensed contractors/technicians to carry out operations on the equipment that are in accordance with what is described in this manual and in the attached documents.

3.9 Intended or Allowed Use

This equipment is an inverter designed to: transform a Direct Electric Current (DC) coming from a photovoltaic generator (PV) into an Alternating Electric Current (AC) connected to an AC grid.

3.10 Limits of the Field Of Use

The operating current dispersed during the normal operation MUST NOT exceed the limits documented in the technical specifications. The inverter can only be used if all the technical characteristics are observed.

3.11 Improper or Prohibited Use

The following actions are prohibited when using this Aurora Inverter.

• Installing the equipment in environments with particular flammability conditions or in adverse or constrained environmental conditions (temperature and humidity).
• Using the equipment with safety devices not working or disabled.

• The inverter meets NEMA4 construction standards. Connection to equipment other than NEMA4 must meet requirements of local codes and standards.

• Modifying the operating parameters that are restricted to the operator and/or parts of the equipment to vary the performance or change its insulations.

• Cleaning with corrosive products that may damage parts of the equipment or generate electrostatic charges.

• Using or installing the equipment or parts without having read and correctly interpreted the contents of the operating and maintenance section.

• Do not warm or dry rags on the unit or accessory parts. This is dangerous and could compromise the ventilation and cooling of the components.

3.12 Safety Instructions

DANGER:

Be sure all flammable materials including construction items are away from the unit. Do not install the inverter in or near potentially explosive areas.

DANGER:

Normally grounded conductors may be ungrounded and energized when a ground-fault is indicated.

- Risk of electric shock
- Test before touching
- Work on the AURORA Inverter must be carried out by qualified personnel.

WARNING:

Do not connect an AURORA Inverter to the electrical distribution grid until after receipt of a letter of authorization from the authority having jurisdiction.

Install the AURORA Inverter in accordance with the electrical standards prescribed by the applicable National Electric Code and/or by other local codes and regulations.

WARNING:

To reduce the risk of fire, connect only to a circuit provided with 15A maximum branch circuit overcurrent protection for UNO-2.0 or UNO-2.5 in accordance with the National Electrical Code.

On the AC output side an automatic magnetothermic switch should be inserted between the Aurora Inverter and the distribution grid.
The Aurora Inverter should be connected to a dedicated branch circuit.

3.13 General Information

The equipment has been manufactured in accordance with the strictest accident-prevention regulations and supplied with safety devices suitable for the protection of components and operators.

Inform the manufacturer about non-standard installation conditions.

It is essential to provide operators with correct information. They must comply with the technical information given in the manual and in the attached documentation.

The instructions given in the manual does not replace the safety devices and technical data for installation and operation mounted on the product. They do not replace the safety regulations enforced in the country of installation and common sense rules.

The manufacturer is willing to train contractors, at its premises or on site, in accordance with conditions to be set out in the contract.

Do not use the equipment if any issues affecting safety or normal operation are found. Avoid temporary repairs. All repairs should be carried out using only factory approved spare parts, installed in accordance with its intended use and by a licensed contractor or authorized Power-One Service representative. Liabilities arising from commercial components are delegated to their respective manufacturers.

3.14 HAZARDOUS AREAS AND OPERATIONS

3.14.1.1 *Environmental conditions and risks*

The equipment can be installed outdoors, but only in environmental conditions that do not prevent its regular operation. Adverse environmental conditions, such as: sun, rain, snow, wind, extreme hot or sever cold, altitudes, humidity, etc., can lead to a reduction in performance.

Power-One CANNOT be held responsible for disposal of the equipment: displays, cables, batteries, accumulators, etc. Therefore the customer must dispose of these substances in accordance with the regulations in the country of installation.
The same precautions should be adopted for dismantling the equipment.

Do not operate around explosives or particularly flammable environmental conditions.

The installer and/or operator should appropriately train personnel in the proper operation of the inverter. The installer and/or operator must properly secure the installation premisis from public access and/or highlight with warning signs to communicate the potential hazards of the equipment, e.g., magnetic fields, hazardous voltages, high temperatures, possibility of discharges, generic hazard, etc.

3.15 THERMAL HAZARD

WARNING: Removal of guards or covers is allowed only 10 minutes after the voltage has been removed or shut-down; this is to let components cool down and allow any electrostatic charges and parasitic voltages to be discharged.

CAUTION HOT: Certain parts may be hot immediately following shut down due to elevated surface temperature(e.g.: transformers, accumulators, coils, etc.). Wait 10 minutes for components to cool. Use caution when touching components within the unit.

3.16 CLOTHING AND PROTECTIVE DEVICES

Sharp edges and corners have been minimized at the factory, but not completely eliminated; therefore, always wear protective clothing and personal protective devices compliant with prevailing safety standards.
Appropriate Personal Protective Equipment (PPE) must be worn at all times when operating or servicing this equipment.

All operations on the equipment should be performed with properly electrically insulated instruments.

3.17 Location of Safety Notices

Please note the location of safety notices on the AURORA Inverter for notification and protection. They are located on both side panels of this unit.

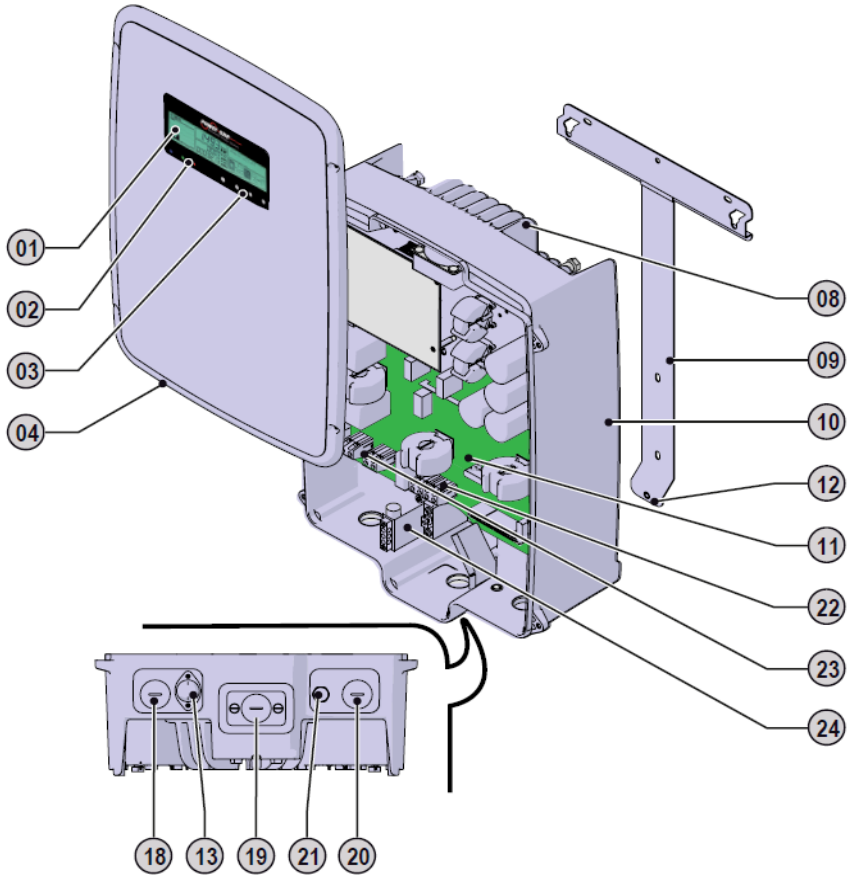
3.18 Safety Notices

The location of safety notices on the AURORA Inverter for notification and protection are located on both sides of the equipment and in the inside of the box.

The notices must be cleaned regularly and kept visible at all times. This means they must NOT be hidden with objects and extraneous parts (rags, boxes, equipment, etc.). The technical data shown in this manual does not in any case replace those shown on the plates attached to the equipment.

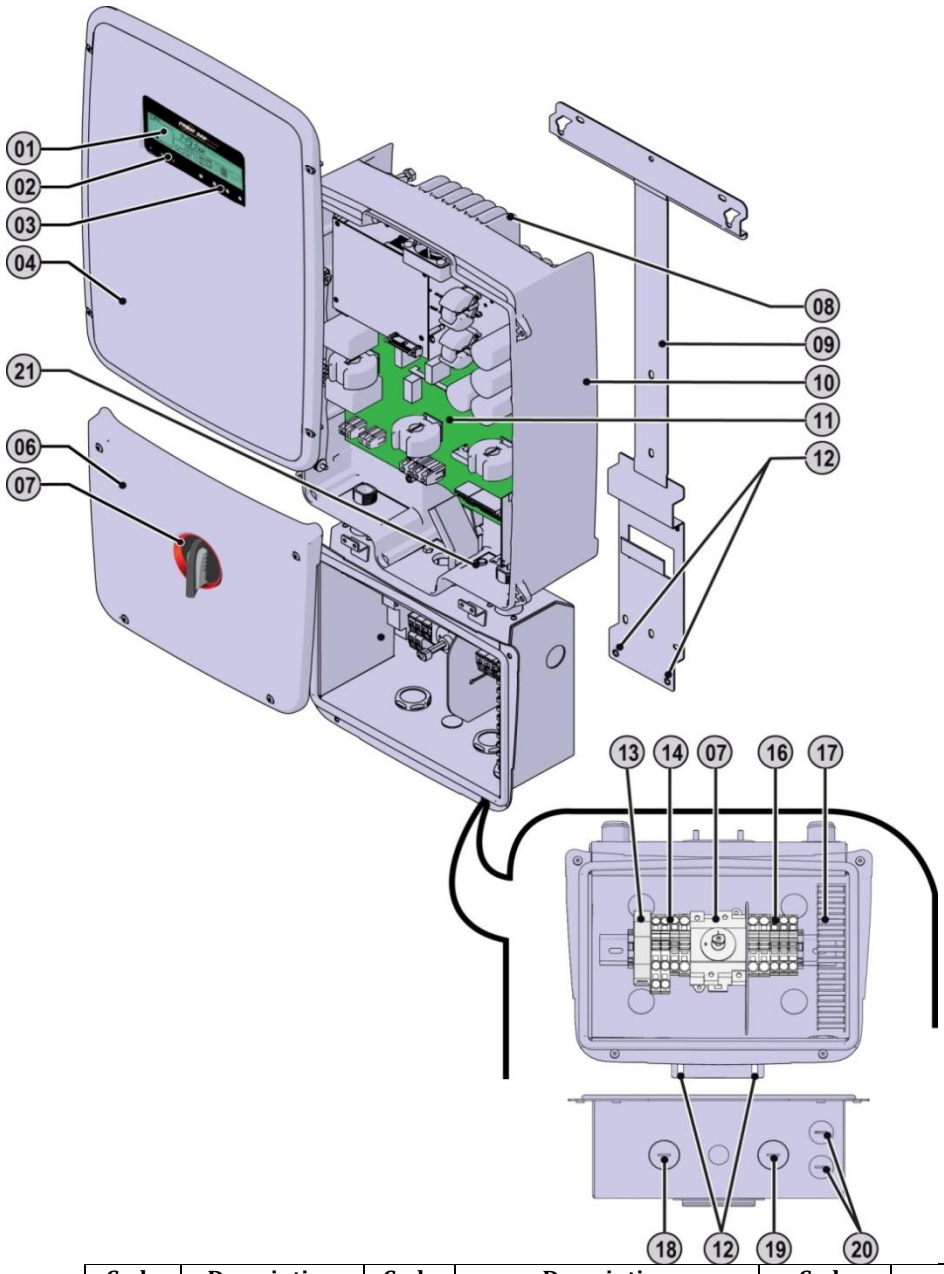
System Architecture

Graphical representation of references



Code	Description	Code	Description	Code	Description
01	Display	10	Inverter	19	AC Conduit Entry
02	LED Panel	11	Main Board	20	Signal Conduit Entry
03	Keypad	12	Locking Screw	21	Anti-Condensation Valve
04	Inverter Front Cover	13	Fuse Holder	22	AC Output Screw Terminal Block
08	Heat Sink	18	DC Conduit Entry	23	DC Input Screw Terminal Block
09	Bracket			24	Ground Terminals

Figure 1.2: Standard Version Graphical Representation



Code	Description	Code	Description	Code	Description
01	Display	10	Inverter	17	Electric Duct
02	LED Panel	11	Main Board	18	DC Conduit Entry
03	Keypad	12	Locking Screw	19	AC Conduit Entry
04	Inverter Front Cover	13	Fuse Holder	20	Signal Knockout
06	Wiring Box Front Cover	14	DC Input Terminal Block	21	Anti-Condensation Valve
07	DC Disconnect Switch	16	AC Output Terminal Block		
08	Heat Sink				
09	Bracket				

Figure 1.3: S Version Graphical Representation

4 FUNCTIONALITY AND COMPONENTS OF THE EQUIPMENT

4.1 DATA TRANSMISSION AND CONTROL

The inverter, or a network of several inverters, can be monitored remotely through an advanced communications system based on an RS-485 serial interface. The range of optional Power-One devices that can be connected to this communication line allows one to monitor the device locally or remotely via internet access.

In addition, it is possible to monitor the inverter(s) via radio link by installing the optional PVI-RADIOMODULE board within the inverter.

4.2 RADIOMODULE

The RADIOMODULE board is an accessory used to add a radio communication to the inverter. It can be used in parallel to the RS-485 line for the transmission of data to the monitoring system.

4.3 CONFIGURABLE RELAY

The inverter has a configurable switching relay that can be used in various operating conditions set in the dedicated menu. A typical application example is the closing of the contact when an alarm occurs.

4.4 POWER ON/ OFF REMOTE

This command can be used to disconnect/connect the inverter to the grid via an external (remote) command.
This functionality must be enabled using the relevant menu using the front panel programming keys: If the inverter is operating, (connected to the grid), within the correct parameter and with the external switch ON/OFF control activated.

4.5 INPUT POLES GROUNDING

The inverter design provides grid isolation via “high-frequency transformer isolation” and is capable of operating from either a positive or a negative referenced PV array, or an ungrounded (“floating”) array. The inverter must be set-up appropriately for the operational mode chosen, and this is done by changing the position of a special wiring connector located inside the inverter.

4.6 STAND-BY MODE

This functionality allows the inverter to remain ON and grid connected even with an input voltage of less than 0.7 x Vstart. It is particularly useful in conditions of low irradiation and with passing shadowed areas that would cause continuous connections and disconnections to the grid.

The time in which the inverter remains in this state can be set by accessing the Settings menu and activating the time for Input Undervoltage Protection (TprotUV). If within the set time the conditions to export power to the grid do not re-occur (i.e. Vin>80VDC), the inverter disconnects from the grid after five minutes and goes into SLEEP Mode. See Part 4: Operations for more information.

4.7 SLEEP MODE

This functionality turns OFF the inverter completely and the power absorption is reduced to a minimum (0.6W).
In this mode, the inverter allows display of the information available even in the absence of input voltage and therefore in the absence of sufficient irradiation of the photovoltaic panels. In fact, the display can be “awakened” by pressing any button on the display with the exception of the ESC button.
After 30 seconds of inactivity the display will once again switch OFF automatically.

4.8 PROTECTIVE DEVICES WITHIN THE AURORA INVERTER

4.9 ANTI-ISLANDING

In accordance with required national standards and laws, in the event of a local grid outage by the utility, or when the grid equipment is switched OFF for maintenance operations, the inverter must be physically and safely disconnected, to ensure protection of personnel working on the grid. To prevent possible islanding, the inverter has an automatic protective disconnection system called “Anti-Islanding”.

4.10 GROUND FAULT IN THE PHOTOVOLTAIC PANELS

An advanced ground fault protection circuit continuously monitors the ground connection and disconnects the inverter when a ground fault occurs, indicating this condition by means of the red GFI LED on the LED panel (02).

4.11 FURTHER PROTECTIVE DEVICES

The inverter is equipped with additional protective devices to guarantee safe operation in any circumstance. These protective devices include:
- Continuous monitoring of the grid voltage to ensure the voltage and frequency values stay within operating limits;
- Control of internal temperatures to automatically limit the power if necessary to ensure the unit does not overheat (derating).

PART 2: UNPACK & SELECT INSTALL LOCATION

5 UNPACK AND INSPECT

WARNING

- Install the AURORA Inverter in accordance with the electrical standards prescribed by the applicable National Electric Code and/or by other local regulations and codes.
- Do not connect an AURORA Inverter to the electrical distribution grid until after receipt of a letter of authorization from the authority having jurisdiction.

5.1 UNPACKING AND CHECKING

Discard packaging elements immediately as to not cause unforeseen injury. Packaging elements (cardboard, cellophane, staples, adhesive, tape, straps, etc) may cause cuts and/or injuries if not handled with care. They should be removed by suitable means and disposed of in accordance with any regulations enforced by the country of installation.

When you open the package, check that the equipment is undamaged and make sure all the components are present.

If any defects or damage are encountered during unpacking of the inverter stop the process and:

1. Document the damage. It is recommended that photographs be taken of the anomalies found.
2. Consult the carrier to determine carrier claim requirements.
3. Inform the Power-One distributor from whom the inverter was purchased.

5.2 INCOMING INSPECTION

It is the customer's responsibility to examine the condition of the unit shipped.
Upon receipt of Power-One's AURORA Inverter, please perform the following check:

- Inspect the shipping container for any external damage.
- Inventory the contents against the listing below and verify receipt of all items. Use care not to discard any equipment, parts, or manuals.
- Call the delivering carrier if damage or shortage is detected.
- If inspection reveals damage to the inverter, contact the supplier, or authorized distributor for a repair/return determination and instructions regarding the return/repair process.

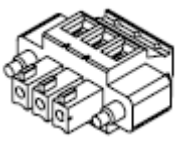
Table 2: Package contents

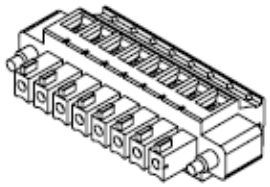
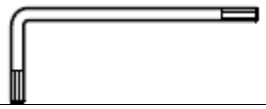
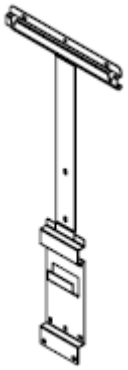
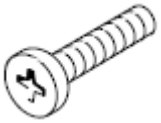
QTY	Description
1	Aurora Inverter
1	Installation and Operator's Manual
1	Certificate of Warranty
1	CD-ROM with Communication Software
1	cCSAus Declaration of Conformity

5.3 LIST OF COMPONENTS SUPPLIED

The components supplied are inserted into a cardboard box placed within the packaging of the UNO 2.0/2.5.

Table 1: Components Supplied with the Equipment

	Components available for all models	Quantity
	Connector for connecting the configurable relay	2

	Connector for the connection of the communication and control signals	2
	L-key, TORX TX25	1
	Bracket for wall mounting (Standard version)	1
	Bracket for wall mounting (-S version)	1
	Bolts and screws for wall mounting	5
	Locking screws and washers for fastening of the inverter to the bracket	2
	User manual and CD-ROM	1

6 LIFT AND TRANSPORT

Some specifications are not applicable to small equipment or components.

6.1 TRANSPORT AND HANDLING

Transport of the equipment, especially by road, must be carried out by suitable ways and means for protecting the components (in particular, the electronic components) from violent shocks, humidity, vibration, etc.

During handling, do not make any sudden or fast movements that can create dangerous swinging.

6.2 LIFTING

Power-One packages and protects individual components using suitable means to make its transport and subsequent handling easier. Due to the weight and complexity of this equipment, Power-One recommends the process of loading/unloading of this equipment be done by an experienced/ specialized staff knowledgeable in material handling.

Where indicated and/or where there is a provision, eyebolts or handles, which can be used as anchorage points, are inserted and/or can be inserted.
Do not lift several units or parts of the equipment at the same time, unless otherwise indicated.

6.3 MODE OF LIFTING

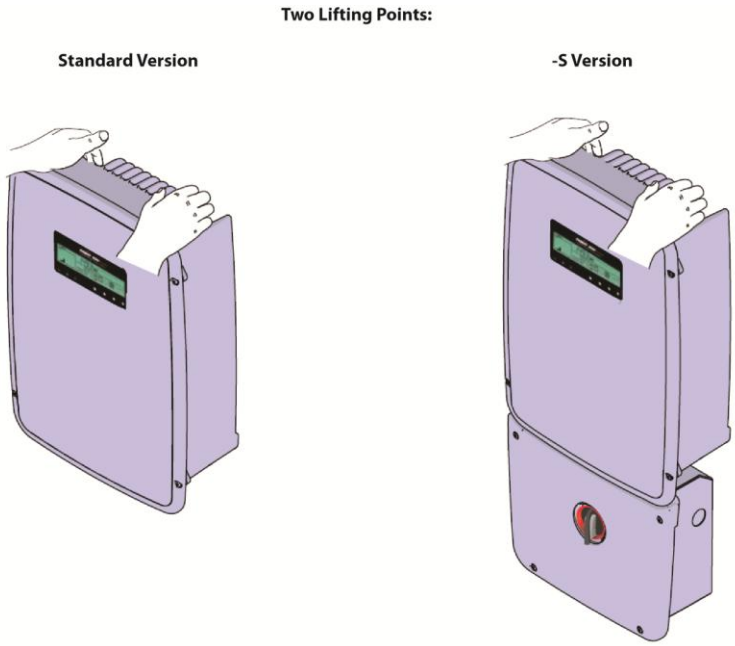


Figure 2.1 UNO-2.0/2.5 lifting points on the unit

6.4 EQUIPMENT WEIGHT

Mass (weight in kg and lb):
UNO-2.0 / UNO-2.5 (Standard version): 17 kg / 37.4 lb
UNO-2.0 / UNO-2.5 (-S version): 19.3 kg / 42.5 lb

WARNING: This unit is heavy and may require two people to lift. Please use proper lifting techniques.

When warehousing boxed inverters, similar products can be stacked to a maximum height of six pieces of equipment. DO NOT stack boxed products with any other equipment or products.

7 SELECT INSTALLATION LOCATION

7.1 NOTES ON DIMENSIONING OF THE SYSTEM

Decisions about how to structure a photovoltaic system depend on a certain number of factors and considerations to meet the type of panels, the availability of space, the expected location of the system, energy production goals over the long term, etc., A program designed to optimize string configuration and help to correctly size the photovoltaic system is available on the Power-One website at www.power-one.com

7.2 OVERALL DIMENSIONS

The overall dimensions are expressed in mm and in inches

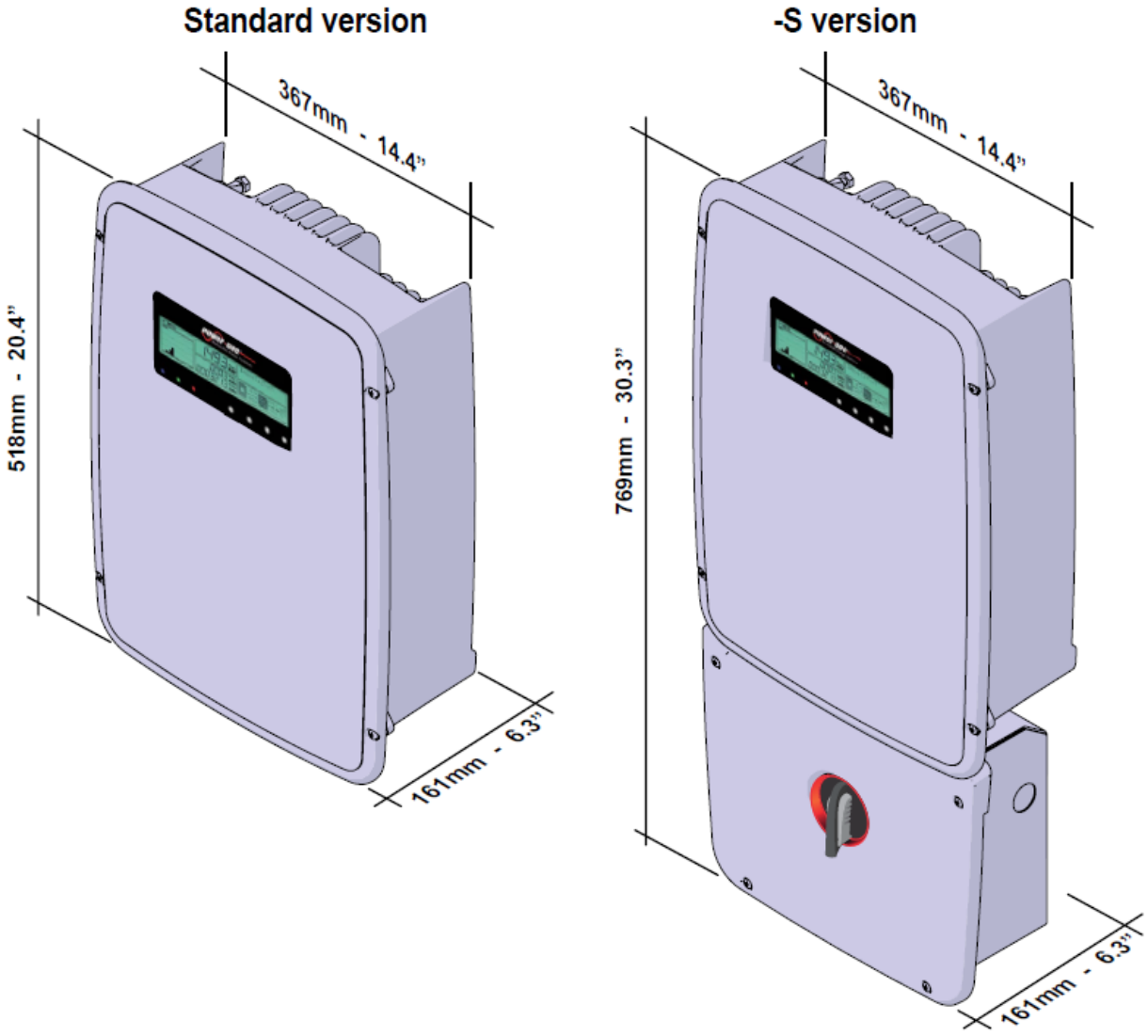


Figure 2.2 Dimensions of the UNO-2.0/2.5-X-I-US

7.3 BRACKET DIMENSIONS

The overall dimensions are expressed in mm and in inches

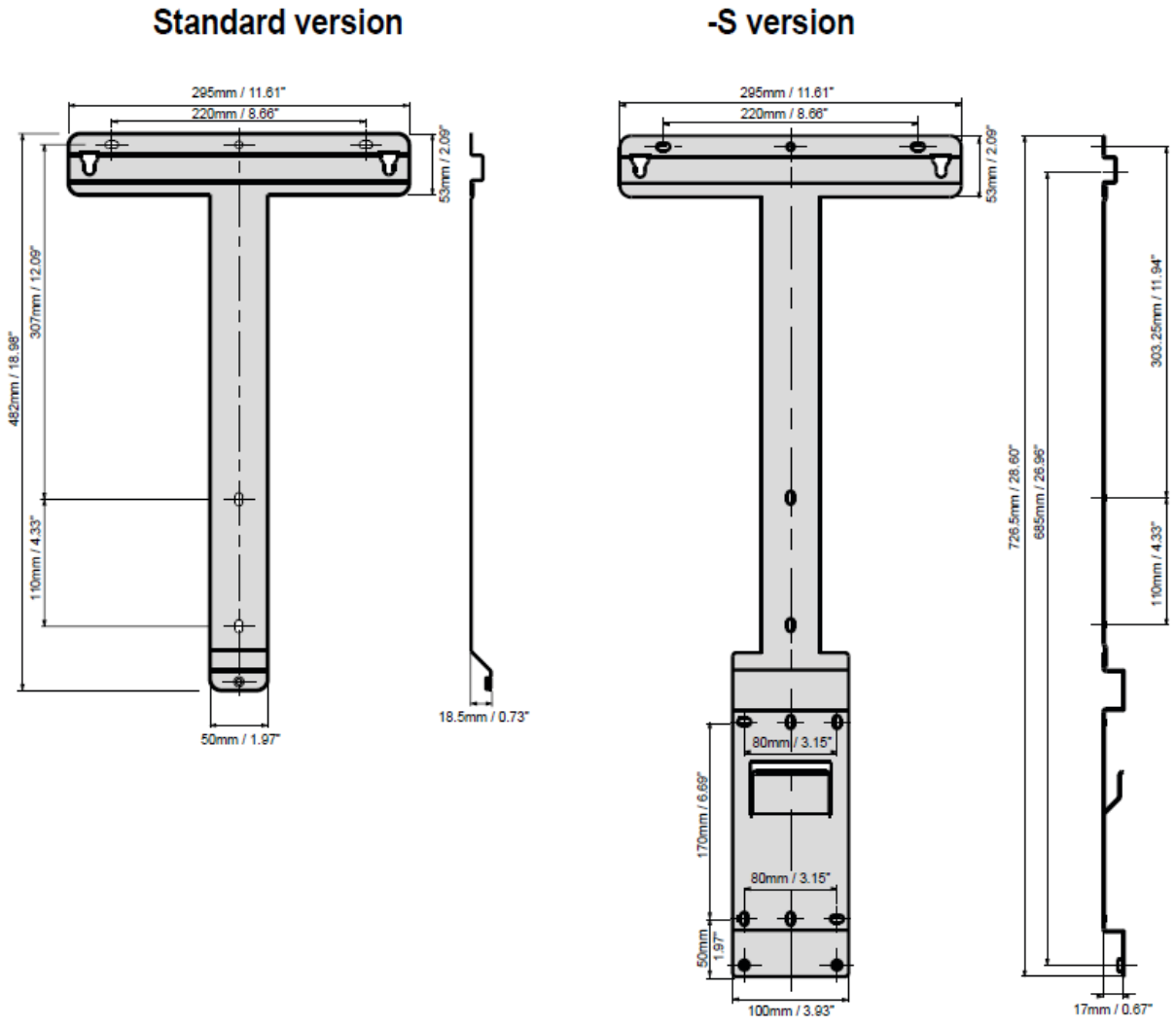


Figure 2.3: Mounting bracket dimensions for the UNO-2.0/2.5-I-X-OUTD

7.4 ENVIRONMENTAL CHECKS

- Consult the technical data to ensure the environmental conditions at the installation site meets requirements such as temperature, humidity, altitude degree of protection, etc.
- DO NOT install in hazardous locations where gasses or flammable substances may be present.
- Position the inverter at the installation site such that it is easily accessible to operators.
- Avoid installing the inverter in areas where rainwater may accumulate.
- For locations where the ambient temperature can exceed 50^0C, it is unnecessary to protect the inverter from direct sun rays, in any case, the ambient temperature should be within the range of working temperatures of the inverter indicated in Part 7: Appendix under technical characteristics.

- For installations in closed environments, sufficient ventilation of the enclosed space is required to prevent heat build up inside the enclosure, and around the inverter. Depending on the specific site this may be via natural convection or a forced air system.

• In case of installation in closed environments, provide good ventilation through the use of specific systems as well.
• Avoid electromagnetic interference that can compromise the correct operation of electronic equipment, with consequent situations of danger.

7.5 OPERATING DIAGRAM

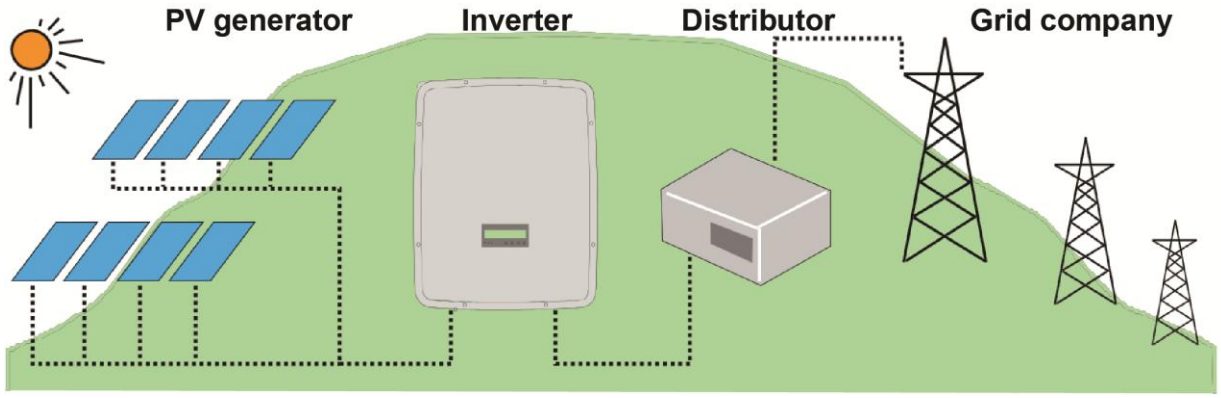


Figure 2.4: Operating diagram of UNO-2.0/2.5-I-X-OUTD

7.6 GENERAL INSTALLATION CONDITIONS

Installation of the equipment is carried out based on the grid system and site in which the equipment is installed; therefore, its performance depends on the accuracy of the connections.

Staff authorized to carry out the installation must be specialized and experienced in this job; they must also have received suitable training on equipment of this type.

The operation must be carried out by licensed contractor or electrician. Comply with what is written in this manual, follow the diagrams and attached documentation.

WARNING:

For safety reason only a qualified electrician, who has received training and / or has demonstrated skills and knowledge in construction and in operation of this unit, can install this inverter.
The installation is done by qualified installers and/or licensed electrician according to the applicable local code regulations (National Electric Code(NEC) & CEC, other local wiring regulations)
The connection of an inverter energy system to the electricity distribution network shall be approved by the appropriate electrical distributor or authority having jurisdiction.
The installation must be carried out with the equipment disconnected from the grid (power disconnect switch open) and with the photovoltaic panels shaded or isolated.

7.7 ENVIRONMENTAL CHECKS:

- See Part 7: Appendix: Technical Data to check the environmental parameters to be observed (degree of protection, temperature, humidity, altitude, etc.)
- Do not expose to direct sunlight to avoid unwanted power derating due to an increase in the internal temperature of the inverter.
- Do not install in small, closed rooms where air cannot circulate freely.
- To avoid overheating, always make sure the flow of air around the inverter is not blocked.
- Do not install in places where gasses or flammable substances may be present.
- Do not install in rooms where people or animals live or are present for long periods of time due to the noise of the inverter.
- Avoid electromagnetic interference that can compromise the correct operation of electronic equipment with consequent situations of danger.

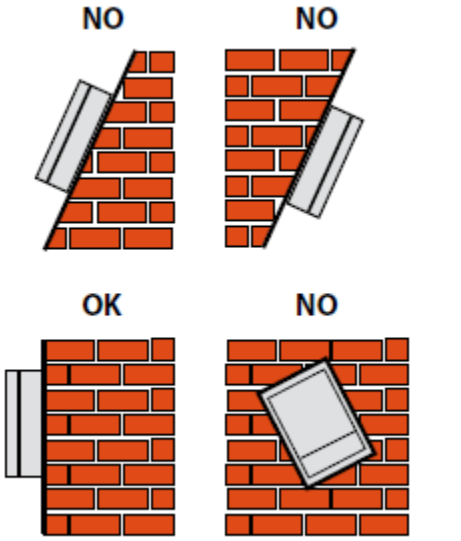
7.8 HIGH ALTITUDE INSTALLATIONS (ABOVE 2000 METERS/6562 FEET)

Information for operation in elevated ambient conditions: When the installation site is in a high-altitude location, the effects of the thin, dry air on the operation of the inverter must be considered:

- **Derating** – Less efficient cooling; therefore, a greater likelihood of the device going into derating because of high internal temperatures.
- **Electric Arc** - Reduction in the dielectric resistance of the air that, in the presence of high-operating voltages (DC input), can create electric arcs (electrical discharges) that may reach the point of damaging the inverter.
- **Component lifetime** - As the altitude increases, the failure rate of some electronic components increases exponentially because of cosmic radiation.

All installations at altitudes of over 2000 meters/6562 Feet must be assessed case by case considering the above listed items.

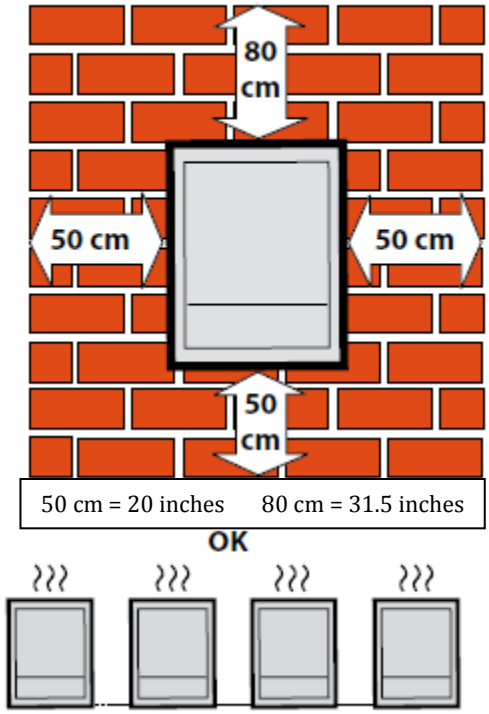
7.9 INSTALLATION POSITION



When choosing the installation site, comply with the following conditions:

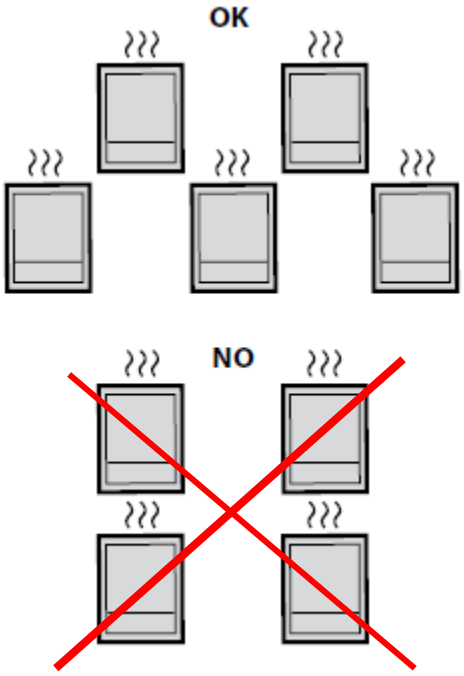
• Install on a wall or strong structure suitable for bearing the weight.
• Install in safe, easy to reach locations.
• If possible, install at eye-level so that the display and status LEDs can be seen easily.

• Install the inverter vertically to within [+/- 5°] ; mounting at any angle outside this range may result in less efficient heat dissipation and automatic limiting of the output power of the inverter.



• To ensure proper access for maintenance and servicing of the hardware and software of the equipment, ensure the installation site provides sufficient safety distances around the inverter. At the minimum, the installation site must allow compliance with the indicated minimum distances.

• For a multiple installation, position the inverters side by side.



• If the space available does not allow the side-by-side arrangement, position the inverters in a staggered arrangement as shown in Figure 2.5 so that heat dissipation is not affected by other inverters.

Figure 2.5: Installation guidance for UNO-2.0/2.5-I-US-OUTD

PART 3: MOUNTING AND WIRING

8 NAMEPLATE

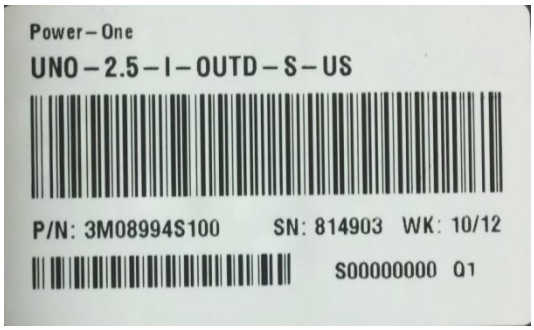
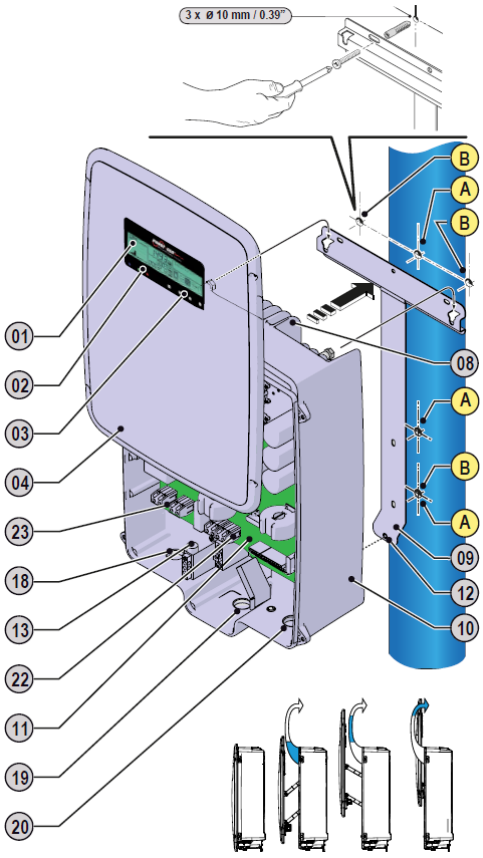


Figure 3.0: Nameplate: UNO-2.5-I-OUTD-S-US

9 WALL MOUNTING

9.1 STANDARD VERSION WALL MOUNTING



Code	Description
01	Display
02	LED Panel
03	Keypad
04	Inverter Front Cover
08	Heat Sink
09	Bracket
10	Inverter
11	Main Board
12	Locking Screw
18	DC Conduit Entry
19	AC Conduit Entry
20	Signal Conduit Entry
22	AC Output Screw Terminal Block

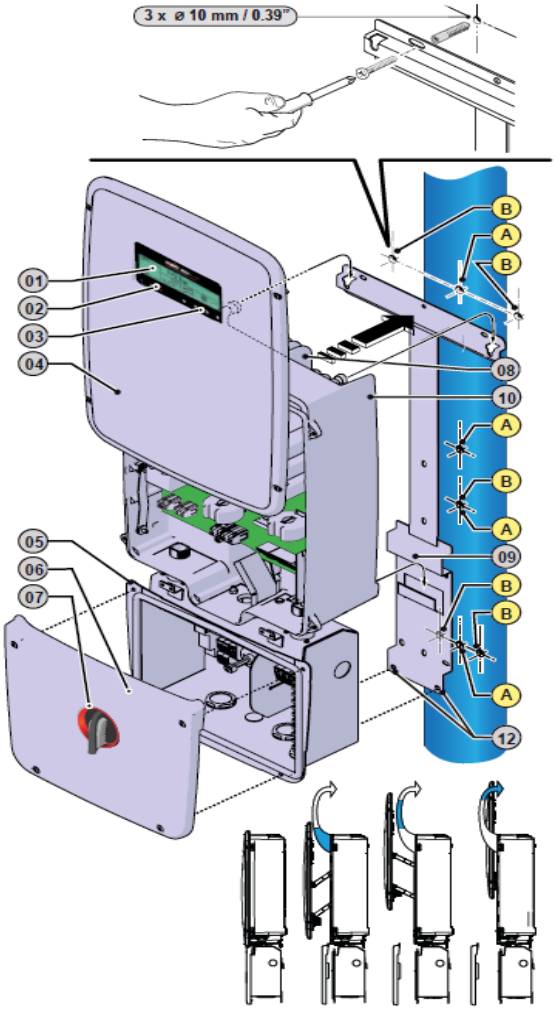
Figure 3.1: Wall mounting for the standard version of UNO-2.0/2.5-I-OUTD-US

During installation do not place the inverter (10) in Figure 3.1 below with the front cover facing towards the ground.

• Position the bracket (09) in Figure 3.1 perfectly level on the wall and use it as a drilling template.

• Drill the three holes required using a drill with 10mm/0.39” bit. The holes must be about 70mm/2.75” deep. On bracket (09) in Figure 3.1 there are five fastening holes, but only three are used depending on the type of installation: on a pole holes A, on a wall holes B.
• Fix the bracket to the wall with the three wall anchors, 10mm/0.39” in diameter, supplied.
• Hook the inverter to the bracket by inserting the head of the rear screws in the slots as shown in the figure.
• Proceed to anchor the inverter to the bracket by tightening the locking screw (12) in Figure 3.1 located on the lower side.
• Unscrew the four screws and open the inverter front cover (04) in Figure 3.1 upwards in order to make all the necessary connections. The cover is equipped with fixed hinges and cannot be removed.
• Once the connections have been made proceed to closing the cover by tightening the four screws on the front to the torque indicated in the technical data in Part 7: Appendix.
• Remove the protective film located on the inverter front cover (04) and on the display (01) in Figure 3.1.

9.2 S VERSION WALL MOUNTING



Code	Description
01	Display
02	LED Panel
03	Keypad
04	Inverter Front Cover
05	DC Switch Wiring Box
06	Wiring Box Front Cover
07	DC Disconnect Switch
08	Heat Sink
09	Bracket
10	Inverter
12	Locking Screw
A	Installation on Pole
B	Installation on Wall

Figure 3.2: Wall mounting for the S version of UNO-2.0/2.5-I-OUTD-S-US

Installing mounting bracket- During installation do not lay the inverter face-first on the ground as this may bend or mar the front cover.

- Refer to Figure 3.2 and note the location of the necessary mounting holes based on the mounting surface:
    - Group A holes are used for pole mounting
    - Group B holes are used for wall mount
- Position the bracket (**09,** Figure 3.2) in the desired mounting position, ensuring it is level, and mark the holes appropriate to the type of mounting surface, as noted above.
- Drill the three holes (installation on pole) or five holes (installation on wall) required using a drill with a 10mm/0.39" bit. The holes must be about 70mm/2.75" deep.
- Fix the bracket to the poll/wall with the 3/5 wall anchors, 10mm/0.39" in diameter, supplied.
- Hook the inverter to the bracket by inserting the head of the rear screws and the anchor point on the wiring box, in the slots of bracket (**09,** as shown in Figure 3.2).
- Proceed to anchor the inverter to the bracket by tightening the locking screw (**12**) in Figure 3.2 located on the lower side.
- In order to make the necessary connections to follow the procedure below:
    - Unscrew the four screws and remove the wiring box front cover (**06**) in Figure 3.2.

      NOTE: This cover must be removed prior to opening the Inverter Front Cover (below).

    - Unscrew the four screws on the Inverter Front Cover (**04,** Figure 3.2)

      NOTE: This cover is equipped with fixed hinges and is not intended to be removed from the chassis – see diagram at the bottom of Figure 3.2.

- Using light pressure pull out and upwards on the cover such that it rotates in an upward arc to its rest position.
- Remove the protective film located on the inverter front cover(04) and display (01) in Figure 3.2.

10 INSTALLATION

10.1 OPERATIONS PREPARATORY TO PHOTOVOLTAIC GENERATOR CONNECTION

10.2 CHECKING THE CORRECT POLARITY OF THE STRINGS

- Using a voltmeter, check the voltage of each string and ensure the connection polarity is correct. Ensure the measured voltage falls within the input voltage specification limit of the inverter (see Part 7: Appendix-Technical Data).
- If the open circuit voltage of any string is close to the maximum accepted inverter voltage, check array design to ensure that voltage will not be outside max allowable range under low-temperature conditions.

10.3 CHECKING OF LEAKAGE TO GROUND OF THE PHOTOVOLTAIC GENERATOR

This test must be done with the string/array in an open circuit condition – both leads floating: **Prior to connecting the array wiring to the inverter, measure** the voltage present between positive and negative pole of each string with respect to ground. If a voltage is measured between an input pole and ground, it may be that there is a low insulation resistance of the photovoltaic generator and the installer will have to carry out a check to solve the problem.

Do not connect the strings if a leakage to ground has been found because this is an unsafe condition. Make sure any leakage condition found is resolved before connecting array to the inverter.

On the AC output side an automatic magnetothermic switch should be inserted between the Aurora Inverter and the distribution grid

To reduce the risk of fire, connect only to a circuit provided with a 15A maximum branch circuit overcurrent protection for UNO-2.0 or UNO-2.5 in accordance with the National Electric Code (ASI/NFPA 70)

The Standard Models of this inverter don't have an integrated DC switch, it must be externally provided by the installer.

10.4 REQUIREMENTS OF THE PHOTOVOLTAIC GENERATOR

If the photovoltaic generator is made up of two or more strings, each string must be identical (PV panel type and string length), and must have the same installation conditions, i.e., oriented toward the sun at the same azimuth.

All input parameters that must be met for the correct operation of the inverter are shown in the specifications.

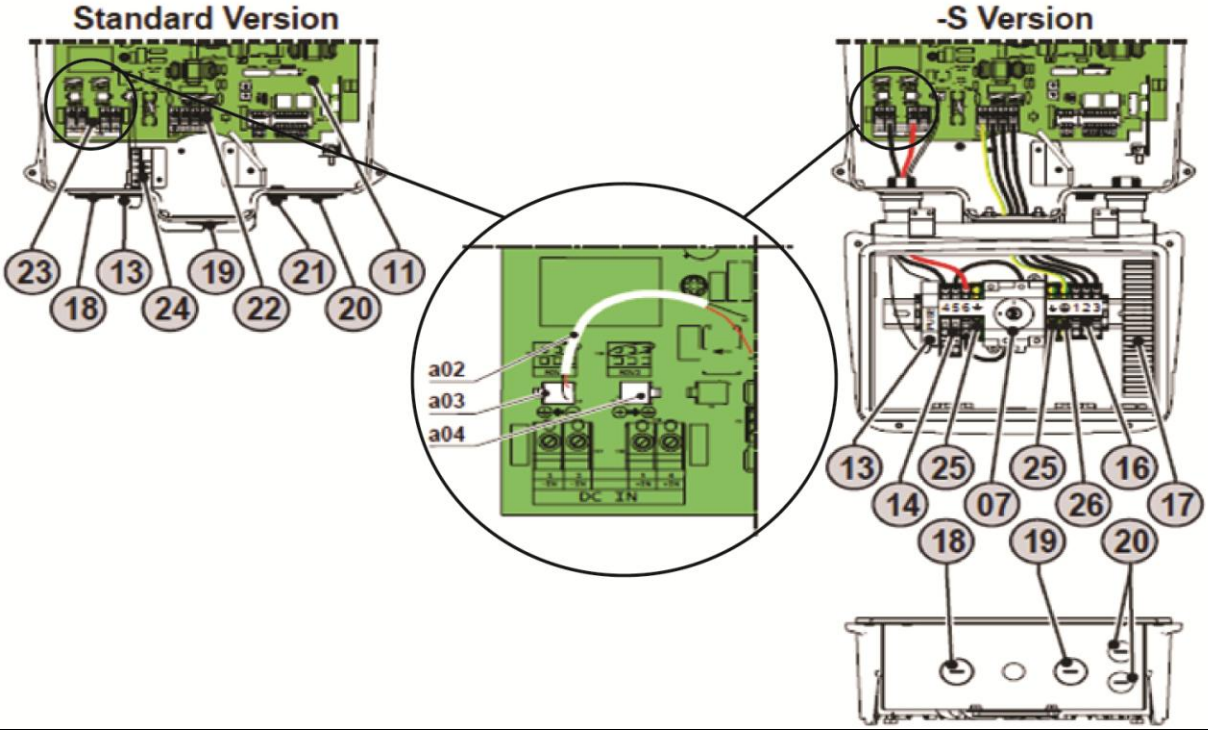
10.5 ELECTRICAL WIRING AND CONNECTIONS

10.6 INVERTER COMPONENTS

For both of the inverter models in Figure 3.1 and 3.2 above (2 kW or 2.5 kW) two different set-ups are available:

UNO-X.X-I-OUTD-US: Standard version in Figure 3.1.

UNO-X.X-I-OUTD-S-US: -S Version equipped with DC disconnect switch **(07)** in Figure 3.2



Code	Description	Code	Description	Code	Description
07	DC Disconnect Switch	18	DC Knockout Plug	24	Earth (ground) Terminal
11	Main Board	19	AC Knockout Plug	25	Earth (ground) Terminal
13	Ground Fault Fuse	20	-Signals Knockout Plug	26	Protective Earth Terminal
14	DC Input Terminal Blocks	21	Condensation Relief Valve		
				a02	Ground cable
16	AC Output Terminal Blocks	22	AC Output Screw Terminal Block	a03	Connector for negative grounding of the inputs
17	Signal Wiring Duct	23	DC Input Screw Terminal Block	a04	Connector for positive grounding of the inputs

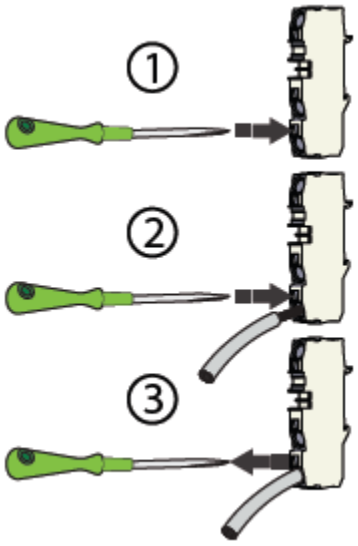
Figure 3.3: Electrical System Components

10.7 HOW TO USE "TERMINAL BLOCK" IN –S VERSION

In order to install the wires in the:

- DC input terminal blocks**(14)**
- AC output terminal blocks **(16)**
- Earth (ground) terminal **(25)**
- Protective Earth terminal **(26)**
-

The –S version of the inverter utilizes pressure type terminal blocks for connection of all conductors. To connect wiring to these blocks use the following procedure:



-Strip ½" of insulation from the end of the conductor to be terminated.
-Use a small (~1/4"wide) flat blade screwdriver to open the pressure contact:

- Insert the screwdriver in the rectangular tool slot.
- Lightly press the screwdriver toward the associated wire slot until the clamp opens; hold the clamp open with the screwdriver.
- Insert the conductor into the associated round wire until seated.
- Release the pressure on the screwdriver and remove it from the slot.
- Check security of wire into the connector by tugging on the wire.

The recommended wire size range for the affected terminal blocks is #12AWG to #6AWG.

UNO-2.0-2.5-I-OUTD_US wire sizing: minimum 90°C rated			
		AWG	AWG
DC Input Wiring	UNO-2.0	#12	#6
	UNO-2.5	#12	#6
Ground	UNO-2.0	#12	#6
	UNO-2.5	#12	#6
AC Output Wiring	UNO-2.0	#12	#6
	UNO-2.5	#12	#6
Main Ground	UNO-2.0	#12	#6
	UNO-2.5	#12	#6

10.8 SYSTEM GROUNDING

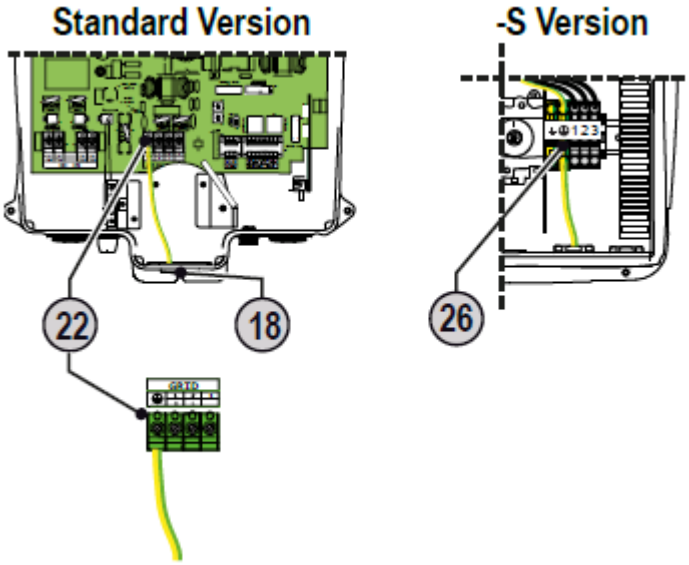
WARNING: To prevent electrical hazards, all the connections must be carried out with the disconnect switch downstream of the inverter (grid side) open and locked.

10.8.1.1 *Protective Earth Connection (PE)*

Both **Standard and -S versions** of the inverter include a Protective Earth terminal ((26) for the external protective conductor (identified by the specified symbol).

In order to plug the input cables into the inverter it is necessary to replace the AC knockout plug(19) with an EMT FITTING 3/4" (thread 14 NPSM). This is a standard NEMA ¾" box connector that matches the wiring method used (EMT, RMT, etc) **NOTE:** EMT Fitting 3/4" is equivalent to PG 21 - EMT Fitting ½ is equivalent to PG 16.

The PE connection terminal is positioned inside the inverter as in the following illustration:



Code	Description	Code	Description
22	AC Output Screw Terminal Block	**26**	Protective Earth Terminal
18	DC Knockout Plug		

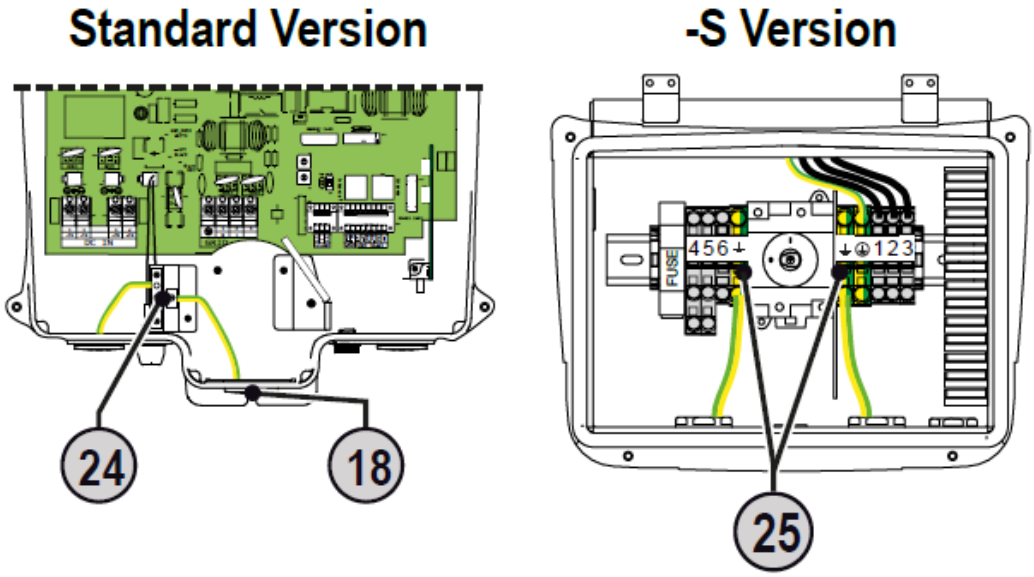
Figure 3.4: PE Connection terminal for UNO-2.0/2.5-I-X-OUTD-US

10.8.1.2 *Earth (Ground) Connection*

Both **Standard and -S** versions of inverter include an Earth (ground) Terminal (24/25) Figure 3.3 for each wiring system (DC input and AC output circuit) identified by the specified symbol.

In order to plug the input cables into the inverter it is necessary to replace the AC knockout plug ((19) Figure 3.3 with an EMT FITTING 3/4" (thread 14 NPSM). This is a standard NEMA ¾" box connector that matches the wiring method used (EMT, RMT, etc) **NOTE:** EMT Fitting 3/4" is equivalent to PG 21 - EMT Fitting ½ is equivalent to PG 16.

The Earth (ground) connection terminal is positioned inside the inverter as in the following illustration:

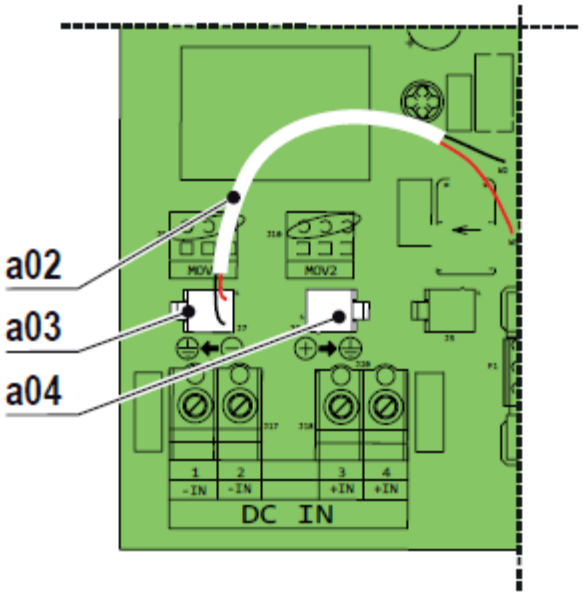


Code	Description	Code	Description
24	Earth (ground) Terminal	**25**	Earth (ground) Terminals
18	DC Knockout plug		

Figure 3.5: Earth Ground connection terminal position UNO-2.0/2.5-I-S-OUTD-US

10.9 CONFIGURATION SETTINGS

10.10 GROUNDING CONFIGURATION OF THE DC INPUTS



Code	Description
a02	Ground Cable
a03	Connector for negative grounding of the inputs
a04	Connector for positive grounding of the inputs

Figure 3.6 Grounding Configuration of the DC Inputs

The grounding of the inputs is negative configuration by default; this means that the grounding cable (a02) in Figure 3.5 is connected in position for negative grounding of the inputs (a03).
The version of the Aurora Uno inverter described by this manual requires one side of the connected PV array to be referenced to ground. The ground reference connection is done internal to the inverter via jumper wiring.

WARNING: The PV array wiring must never be referenced to a ground point external to the inverter as this will defeat the GFD control!

The Uno is provisioned with capability to connect arrays requiring either the **POS**itive or **NEG**ative reference to ground.

The default setting of the inverter is a **NEG**ative ground reference, and the grounding cable **(a02)** in Figure 3.5 is connected to the terminal block in position **(a03)**.

Some photovoltaic panels require a **POS**itive ground reference and therefore the **POS**itive side of an array utilizing this type of panel must be referenced to ground. This is achieved by moving the grounding cable (**a02**) in Figure 3.5 from the default position (terminal (**a03**) to terminal (**a04**).

In order to achieve this, it is possible to vary the default configuration.

The configuration of the grounding of the inputs must be done before any connections or testing takes place. Incorrect configuration may cause damage to the system and photovoltaic panels!

After undergoing preliminary checks and having verified that there are no problems in the photovoltaic system, you can connect the inverter to the inputs

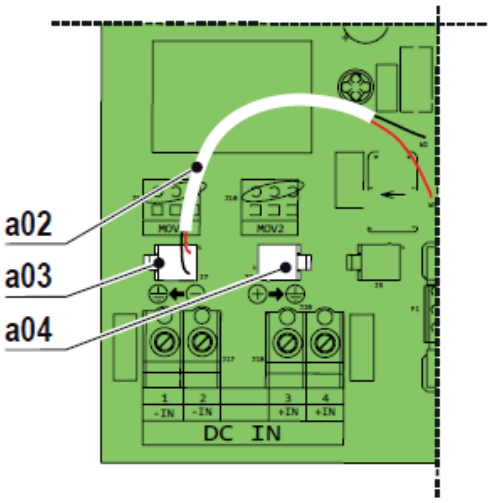
To prevent electrical hazards, all the connections must be carried out with the DC disconnect switch (07) in Figure 3.2 or Figure 3.3 or the external disconnect switch open and locked!

For Safety reasons only a qualified electrician, who has received training and/or has demonstrated skills and knowledge in construction and in operation of this unit, can install this inverter.

The installation is done by qualified installers and/or licensed electricians according to the applicable local code regulations (National Electric Code, Canadian Electric Code and other).

10.10.1.1 ***Standard Version*** *Negative Grounding (default configuration)*

Inverter ground connection: Connect ground cable [a02] to the connector for negative grounding of the DC inputs [a03]



Code	Description
a02	Ground Cable
a03	Connector for negative grounding of the inputs
a04	Connector for positive grounding of the inputs

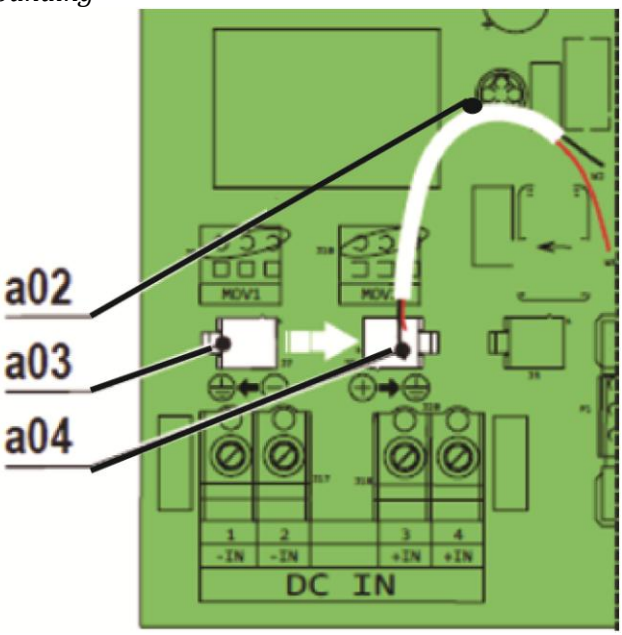
Figure 3.7: Standard Version Negative Grounding

In order to plug the input cables into the inverter it is necessary to replace the DC knockout plug (18) with an EMT FITTING 3/4" (thread 14 NPSM). This is a standard NEMA ¾" box connector that matches the wiring method used (EMT, RMT, etc) **NOTE:** EMT Fitting 3/4" is equivalent to PG 21 - EMT Fitting ½ is equivalent to PG 16.

See Part 7 Appendix to determine the EMT tightening torque values to maintain the NEMA 4X environmental protection rating.

10.10.1.2 ***Standard Version*** *Positive Grounding*

Inverter Ground Connection:
Connect ground cable [a02] to the connector for positive grounding of the DC inputs [a04]



Code	Description
a02	Ground Cable
a03	Connector for negative grounding of the inputs
a04	Connector for positive grounding of the inputs

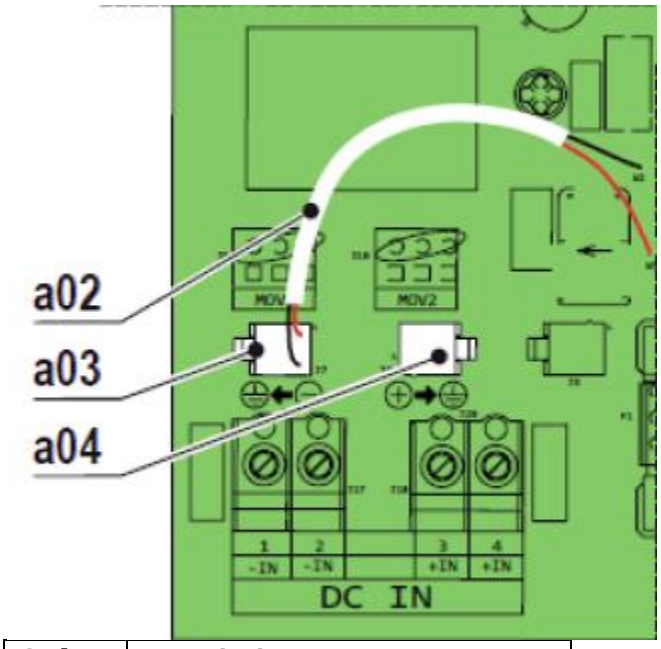
Figure 3.8a: -S version positive grounding

In order to plug the input cables into the inverter it is necessary to replace the DC Knockout plug (18) with an EMT FITTING 3/4" (thread 14 NPSM). This is a standard NEMA ¾" box connector that matches the wiring method used (EMT, RMT, etc) **NOTE:** EMT Fitting 3/4" is equivalent to PG 21 - EMT Fitting ½ is equivalent to PG 16.

See Part 7 Appendix to determine the EMT tightening torque values to maintain the NEMA 4X environmental protection rating.

10.10.2 -S Version Negative Grounding (default configuration)

Inverter Ground Connection:
In the inverter box, connect ground cable [a02] to the connector for negative grounding of the DC inputs [a03].

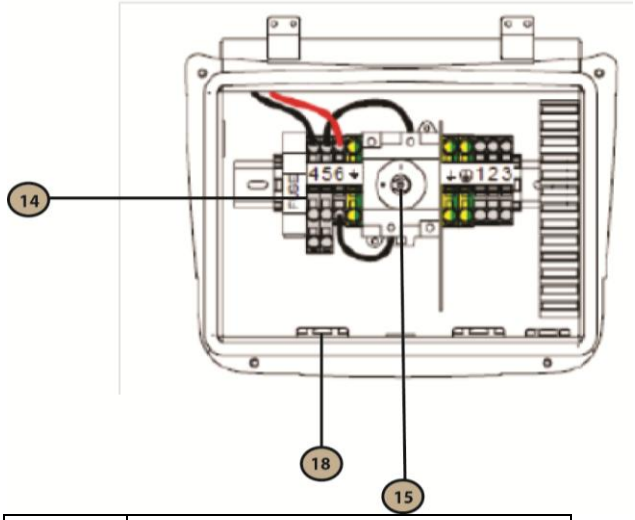


Code	Description
a02	Ground Cable
a03	Connector for negative grounding of the inputs
a04	Connector for positive grounding of the inputs

Figure 3.8b: S Version Negative Grounding

DC Switch Wiring Box Internal connections:
In the DC switch wiring box, connect the internal DC connection cables to the DC Input terminal blocks [14] as follows:

Position 4: Negative input poles
Position 6: Positive input poles



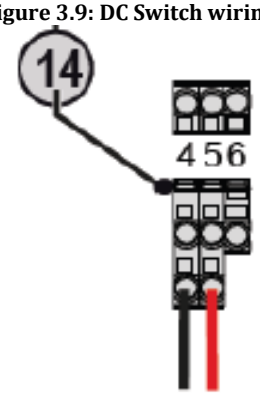
Code	Description
14	DC Input Terminal Blocks

18	DC Plug Screw
15	DC Switch

Figure 3.9: DC Switch wiring box internal connections

DC Switch Wiring Box PV String connection:
In the DC Switch Wiring Box, connect the DC input cables from the PV string to the DC input terminal block [14] as follows:

Position 4: Negative input pole of the photovoltaic generator
Position 5: Positive input pole of the photovoltaic generator



Code	Description
14	DC Input Terminal Blocks

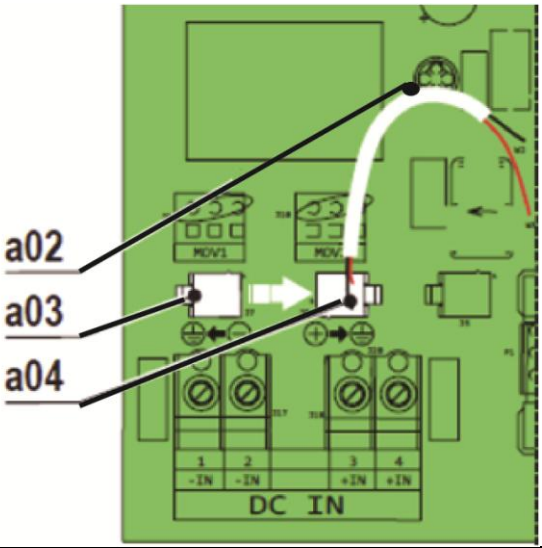
Figure 3.10: DC Switch box wiring PV string connections

In order to plug the input cables into the inverter it is necessary to replace the DC Knockout Plug (18) with an EMT FITTING 3/4" (thread 14 NPSM). This is a standard NEMA ¾" box connector that matches the wiring method used (EMT, RMT, etc) **NOTE:** EMT Fitting 3/4" is equivalent to PG 21 - EMT Fitting ½ is equivalent to PG 16.

See Part 7 Appendix to determine the EMT tightening torque values to maintain the NEMA 4X environmental protection rating.

10.11 -S VERSION POSITIVE GROUNDING

Inverter Ground Connection:
In the inverter box, connect ground cable [a02] from the default position [a03] to the connector for positive grounding of the DC inputs [a04].



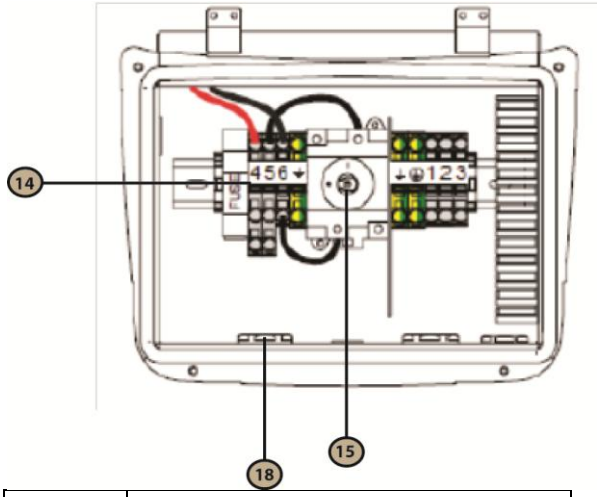
Code	Description
a02	Ground Cable
a03	Connector for negative grounding of the inputs

a04	Connector for positive grounding of the inputs

Figure 3.11: Inverter Grounding Connection

DC Switch Wiring Box Internal connections:
In the DC Switch Wiring Box, connect the internal DC connection cables to the DC Input terminal block [14] as follows:

Position 4: Positive input poles
Position 5: Negative input poles

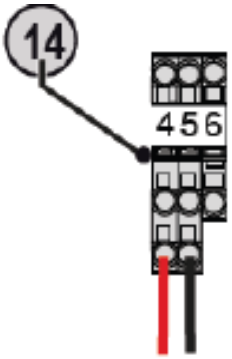


Code	Description
14	DC Input Terminal Blocks
18	DC Plug Screw
15	DC Switch

Figure 3.12 DC Switch Box Wiring Internal Connections

DC Switch Wiring Box PV String connection:
In the DC Switch Wiring Box, connect the DC input cables from the PV string to the DC input terminal block [14] as follows:

Position 4: Positive input pole of the photovoltaic generator
Position 5: Negative input pole of the photovoltaic generator



Code	Description
14	DC Input Terminal Blocks

Figure 3.13: DC Switch box wiring PV String Connections

In order to plug the input cables into the inverter it is necessary to replace the DC Knockout Plug (18) with an EMT FITTING 3/4" (thread 14 NPSM). This is a standard NEMA ¾" box connector that matches the wiring method used (EMT, RMT, etc) **NOTE:** EMT Fitting 3/4" is equivalent to PG 21 - EMT Fitting ½ is equivalent to PG 16.

See Part 7 Appendix to determine the EMT tightening torque values to maintain the NEMA 4X environmental protection rating.

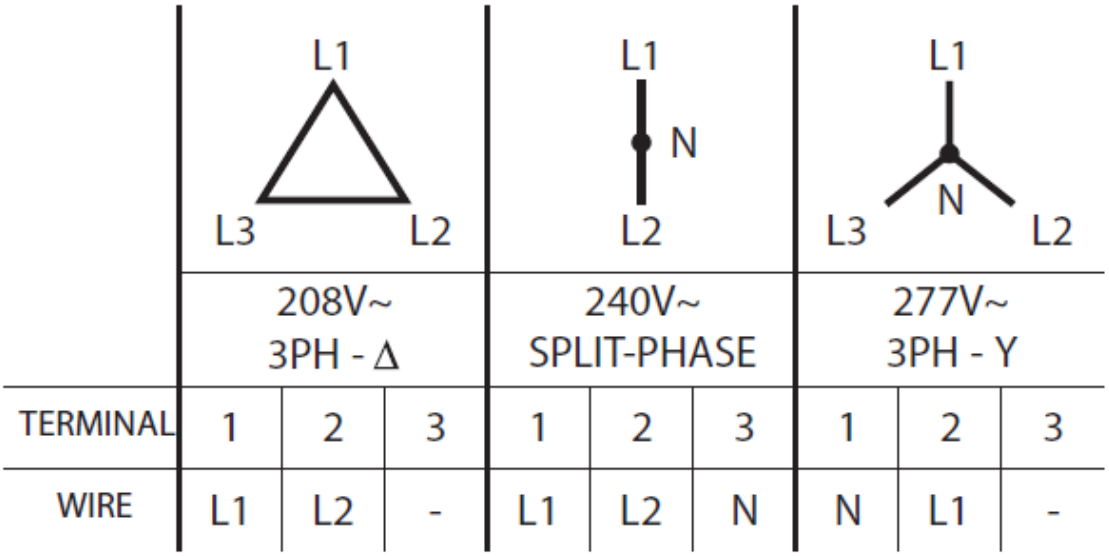
10.12 GRID OUTPUT CONNECTION (AC SIDE)

For safety reasons only a qualified electrician, who has received training and/or has demonstrated skills and knowledge in construction and in operation of this unit, can install this inverter.

The installation is done by qualified installers and/or licensed electrician according to the applicable local code regulations (National Electric Code NEC and CEC, or other local code wiring regulations).

The connection of an inverter energy system to an electrical installation connected to the electricity distribution network shall be approved by the appropriate electrical distributor.

Below are the utility voltage configurations on which the inverter should be connected.



	208V~ 3PH - Δ			240V~ SPLIT-PHASE			277V~ 3PH - Y		
TERMINAL	1	2	3	1	2	3	1	2	3
WIRE	L1	L2	-	L1	L2	N	N	L1	-

Table 4: Utility Voltage Configuration

The AC wires should be connected based on the above table of utility voltage configuration. Three terminal positions (1, 2, and 3) are present on the inverter AC terminal block as in the illustration above.

10.13 CHARACTERISTICS AND SIZING OF THE AC CABLES

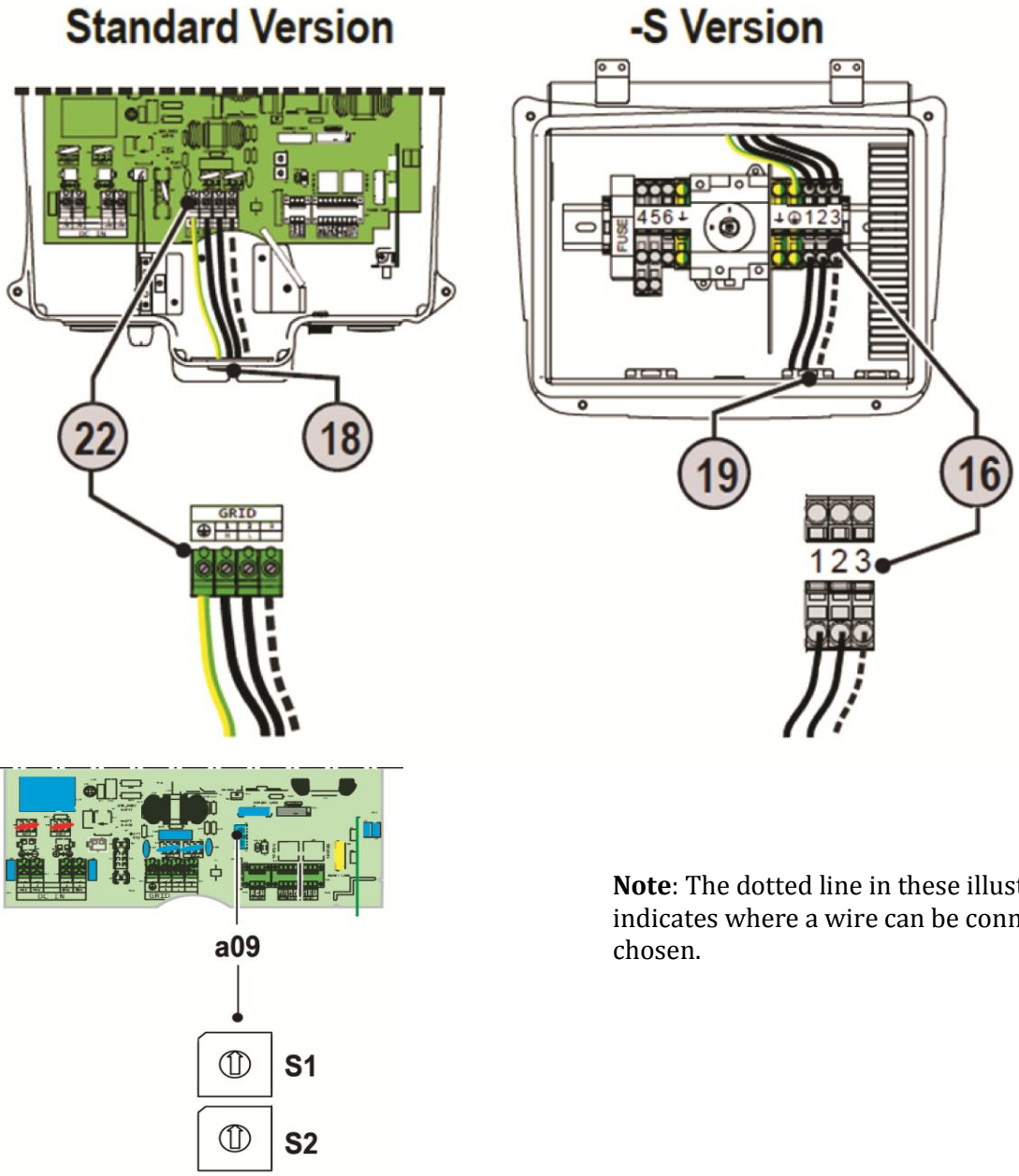
The cross-section of the AC line conductor must be sized correctly in order to prevent unwanted disconnections of the inverter from the grid due to high impedance of the line that connects the inverter to the power supply point. If the impedance is too high, it causes an increase in the AC voltage that, on reaching the limit set by the country of installation, causes the inverter to switch OFF.

10.14 CONNECTION TO THE AC SIDE TERMINAL BLOCK

Connect the AC wires on the inverter AC terminal block (1, 2, 3) based on the utility voltage configuration table above.

In order to plug the input cables into the inverter is necessary to replace the AC Knockout Plug (19) with an EMT FITTING 3/4" (thread 14 NPSM). This is a standard NEMA ¾" box connector that matches the wiring method used (EMT, RMT, etc) **NOTE:** EMT Fitting 3/4" is equivalent to PG 21 - EMT Fitting ½ is equivalent to PG 16.

The illustrations below show the AC connection for both **Standard and -S version** of the inverter.

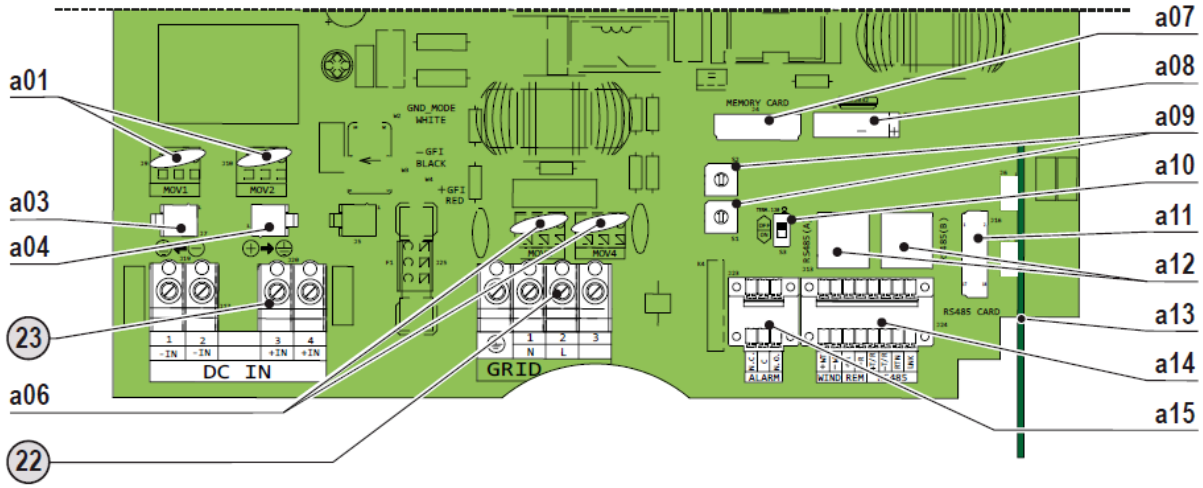


Note: The dotted line in these illustrations indicates where a wire can be connected if chosen.

Code	Description	Code	Description
16	AC Output Terminal Blocks	19	AC Conduit Entry
18	DC Knockout Plug	22	AC Output Screw Terminal Block
a09	Rotary Switches		

Figure 3.14: AC connection for Standard (UNO-2.0/2.5-I-OUTD-US) and S version (UNO 2.0/2.5-I-S-OUTD-US)

10.15 CONNECTIONS OF THE SIGNALS TO THE MAIN BOARD



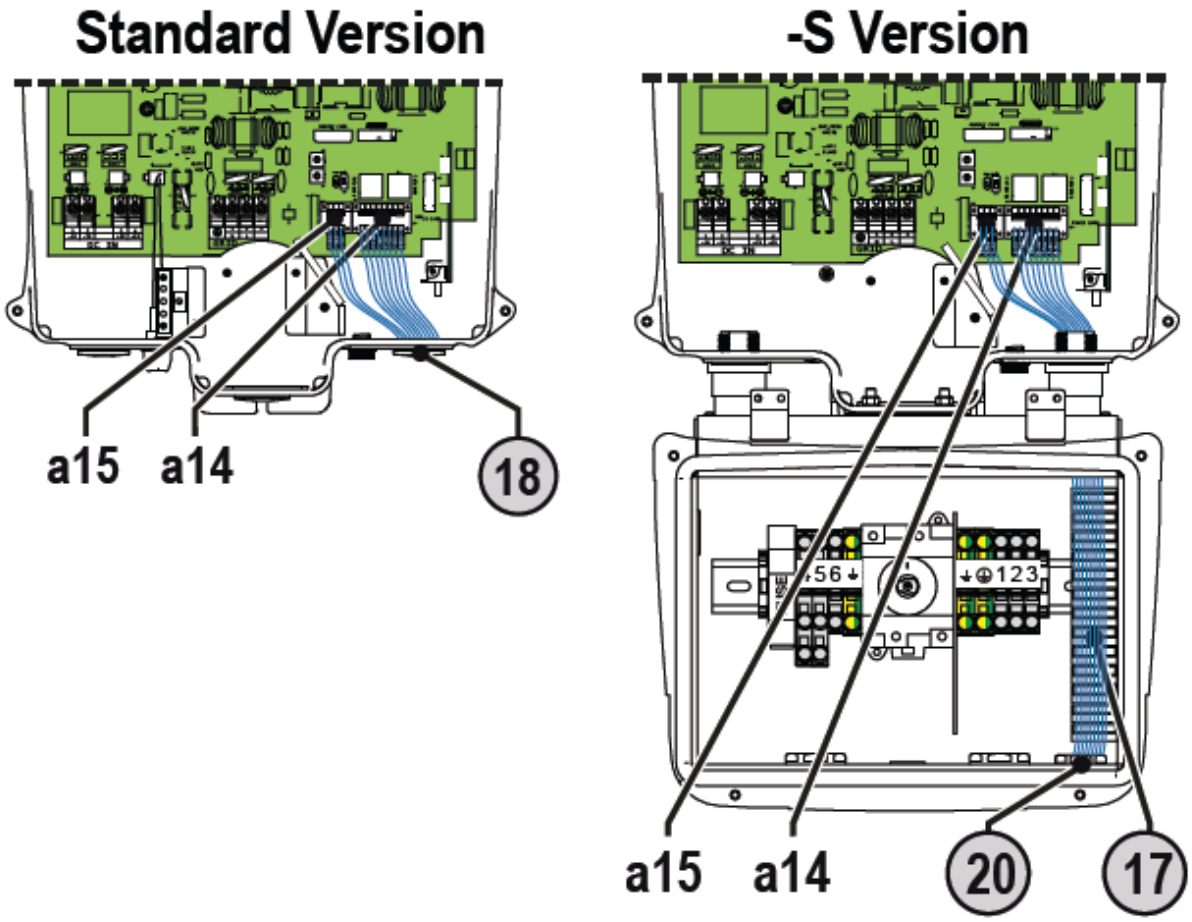
Ref. manual	Ref. inverter	Main board 11 Description
a01	J9 - J10	Input varistors
a03	J7	Connector for negative grounding of the inputs
a04	J8	Connector for positive grounding of the inputs
a06	J11 - J12	Output varistors
a07	J4	Inverter data memory card housing
a08	BT1	Battery housing
a09	S1 - S2	Rotary switches for setting the standard of the country and the language of the display
a10	S3	Switch for setting the termination resistance of the RS485 line
a11	J16	RS485 communication card housing
a12	J13 - J14	Connection of the RS485 line on RJ45 connector
a13	J6 - J15	Radiomodule board slot
a14	J24	Speed sensor connections, remote control, RS485
a15	J23	Connection to the multi-function relay
22	J19 - J20	AC output screw terminal block
23	J21 - J22	DC intput screw terminal block

Figure 3.15: Main Board

Each cable connected to the connectors of the communication and control signals must pass through the signal access and signal wiring duct (17) shown in the Figure 3.16 below.

In order to plug the signal cables into the inverter it is necessary to replace the signal plug screw (20) with an EMT FITTING 3/4" (thread 14 NPSM). This is a standard NEMA ¾" box connector that matches the wiring method used (EMT, RMT, etc) **NOTE:** EMT Fitting 3/4" is equivalent to PG 21 - EMT Fitting ½ is equivalent to PG 16.

See Part 7 Appendix to determine the EMT tightening torque values to maintain the NEMA 4X environmental protection rating.



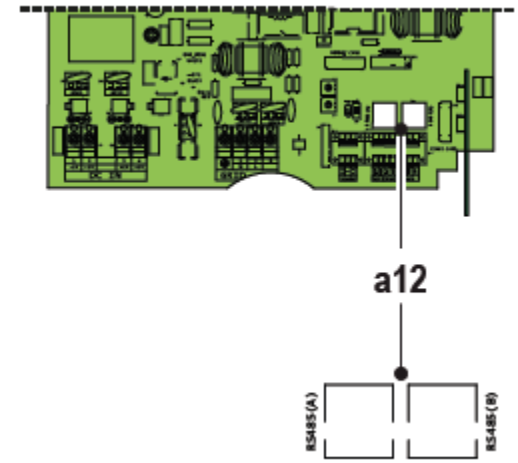
Code	Description	Code	Description
a15	Connection to the multi-function relay	17	Signal Wiring
a14	Remote control, RS485	18	DC Knockout Plug
		20	Signal Knockout Plug

Figure 3.16: Connection to the communication signal

The signal cables are connected to the main board (11) in Figure 3.15 inside the inverter by means of the terminal connectors supplied.

10.16 SERIAL COMMUNICATION CONNECTION (RS485)

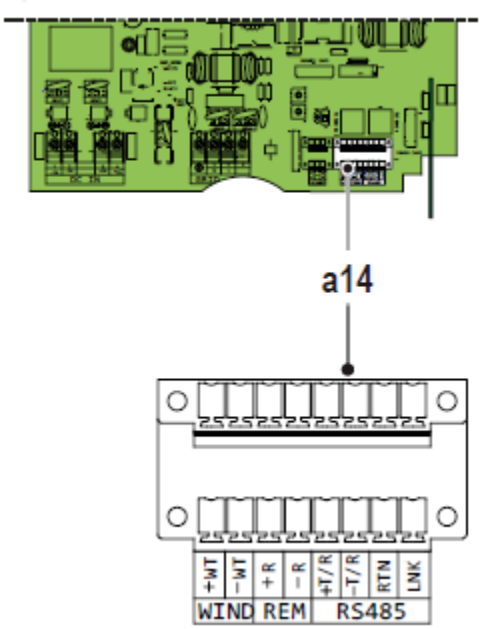
The RS485 communication line is responsible for connecting the inverter to the monitoring devices or for carrying out “daisy-chain” (in-out) connections of multiple inverters. The RS485 connecting cables can use both the terminal connections (a14) in Figure 3.15 as well as the RJ45 connectors to be connected to the dedicated port (a12) (displayed below).



Connection of conductors with RJ45 connectors a12

The RJ45 connectors (A) and (B) available for the RS485 communication, are equivalent to each other and can be used interchangeably for the input or for the output of the line to create the daisy chain connection of the inverters.

The same is true for connections made using the terminal connectors (a14) in Figure 3.17.



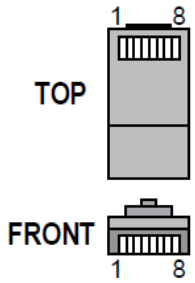
Connection of the conductors using the terminal connectors a14 (+T/R, -T/R, RTN and LNK).

The LNK connection must be used for connecting the shielding boot(s) of the cable(s).

Code	Description	Code	Description
a12	Connection of the RS485 line on RJ45	a14	Remote control, RS485

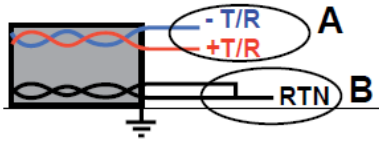
Figure 3.17: Serial communication connection

Table 5: Crimping Scheme Connectors RJ45



Pin N°	Function
1	not used
2	not used
3	+T/R
4	not used
5	-T/R
6	not used
7	RTN
8	not used

For long distance connections, a shielded twisted pair of cable is recommended with characteristic impedance (Z0) of 120 Ohm as shown in the following table:

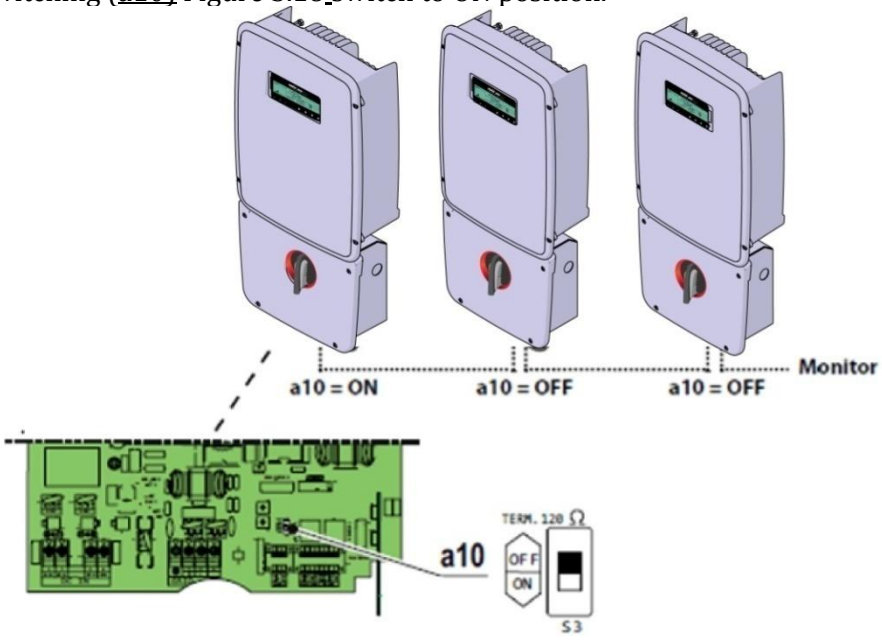


Signal	Symbol	Pair	Cable
Positive data	+T/R	A	1
Negative data	-T/R	A	2
Reference	RTN	B	1+2

Use a connector with metal body to provide cable shield continuity! Shield continuity must be provided along the communication line using the LNK terminal and must be grounded at a single point.

10.17 PROCEDURE FOR CONNECTION TO A MONITORING SYSTEM

Connect all the units of the RS485 chain in accordance with the "daisy-chain" arrangement ("IN-OUT") observing the correspondence between signals.
Activate the termination resistance of the communication line in the last element of the chain by switching (a10) Figure 3.18 switch to ON position.

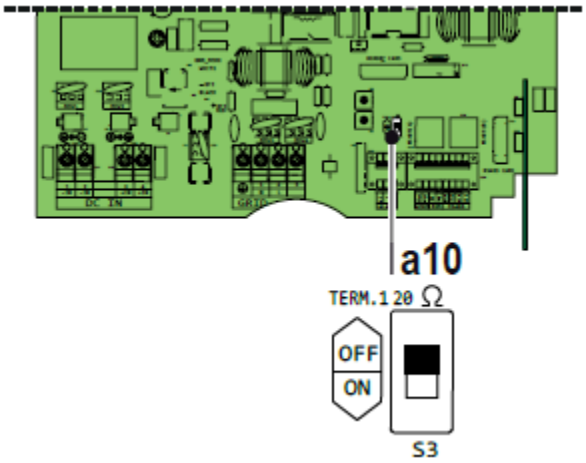


Code	Description
a10	Switch for setting the termination resistance of the RS485 line

Figure 3.18: Connecting to a monitoring system with daisy-chain arrangement

If a single inverter is connected to the monitoring system, activate the termination resistance of the communication line by switching switch (a10) Figure 3.18 (to ON position).
Set a different RS485 address on each inverter of the chain. **No inverter should have "Auto" as its address**. An address can be chosen freely from out of 2 to 63.
The address on the inverter is set through the display and the push-button panel (see Part 4, Operations for more information)

The length of the RS485 communication line must not exceed 1000m to ensure good connectivity.
No more than 62 inverters can be connected to the same RS485 line.



If one or more inverters are added to a system at a later time, for continued proper operation of the RS485 communication system, ensure any new inverters have proper addresses set and that only the last inverter in the chain has the bus termination switch (a10) in the ON (active) position.

When shipped from the factory, the following defaults are set:

- RS485 address: default is address two (2)
- Bus Termination switch (a10): default setting is the OFF position.

Code	Description
a10	Switch for setting the termination resistance of the RS485 line

Figure 3.19: RS-485 connection

10.18 MONITORING SYSTEM VIA SERIAL (RS485)

The RS485 line can be connected to various monitoring devices that can be in **local** or **remote** mode:
• **Local monitoring from PC** with **PVI-USB-RS485_232** adaptor and **Aurora Communicator** software
• **Local monitoring from a remote display** such as the **PVI-DESKTOP** device.
• **Remote monitoring** with **PVI-AEC-EVO** monitoring system and Aurora Vision **Portal P1**

For local monitoring, ***Power-One*** recommends connecting its PVI-USB-RS485_232 adaptor between the first unit of the daisy-chain and the computer.

Equivalent USB-RS485 adaptors are available on the market can also be used for the same purpose; however, they have never been specifically tested and Power-One cannot guarantee correct operation of the connection.
Please note that these devices may also require external termination impedance, whereas this is **not necessary** when using the Aurora PVI-USB-RS485_232.

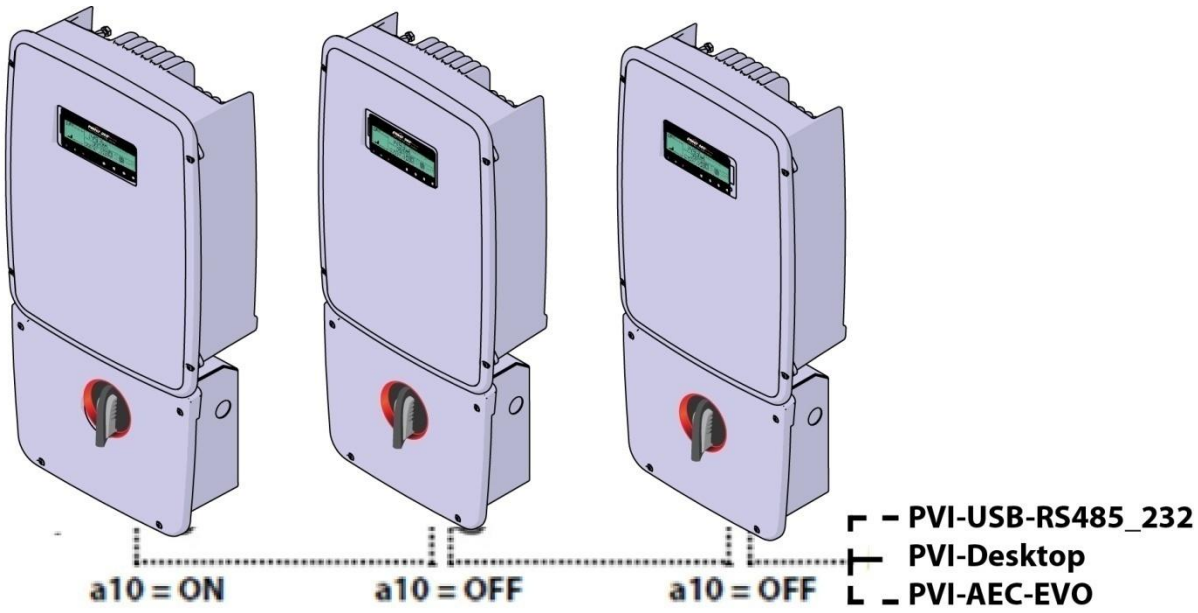


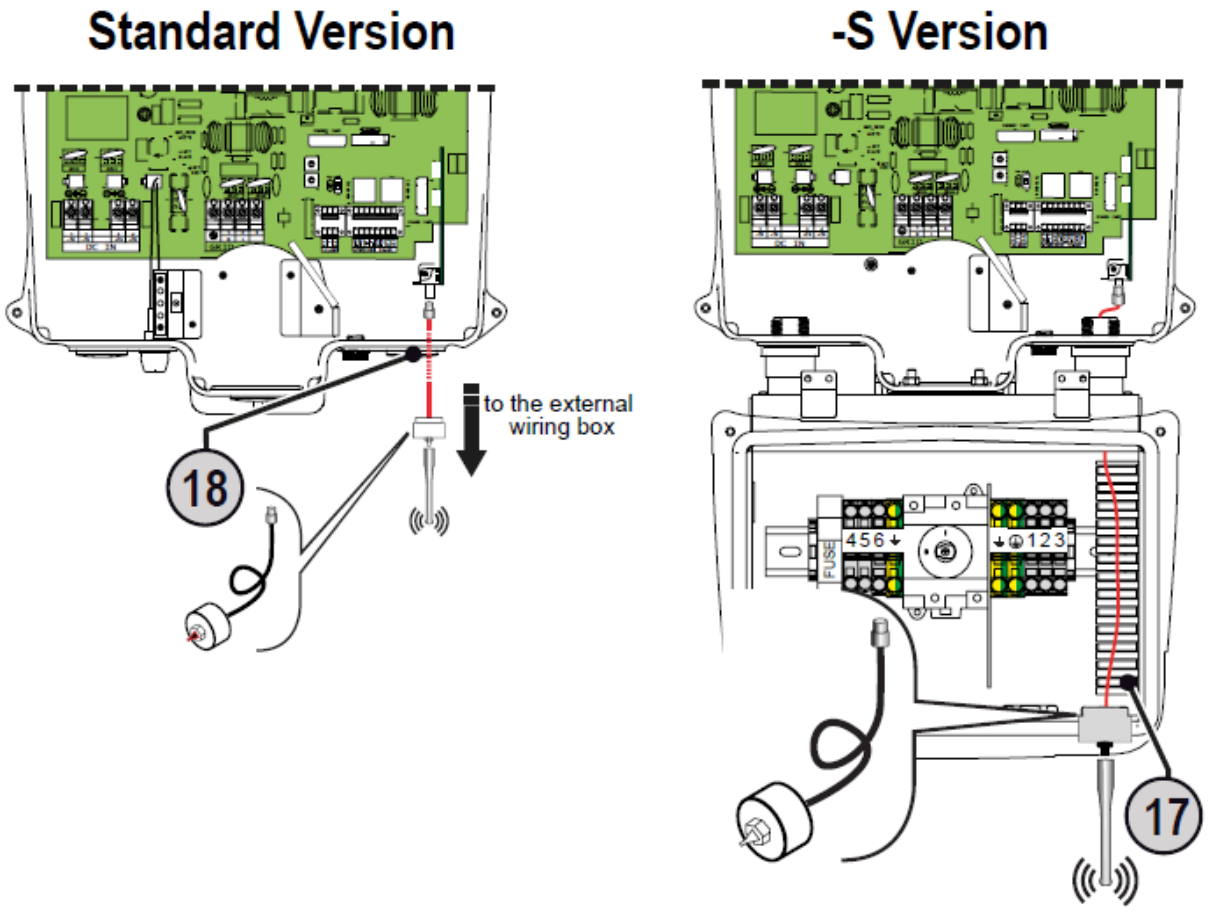
Figure: 3.20: Monitoring system via serial connection

10.19 MONITORING SYSTEM VIA POWER-ONE RADIOMODULE

The Aurora PVI-RADIOMODULE board is an accessory for the wireless transmission of data via radio waves to a monitoring device.

It is installed on the main board (11) (in Figure 3.15 above). It is mounted vertically and connected to the inverter via two connectors (a13) and anchored using two screws.

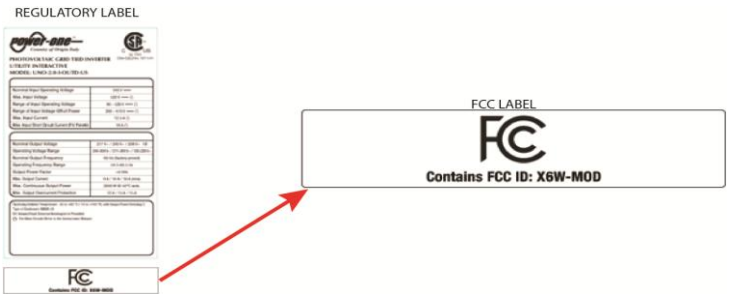
It is necessary to install the included antenna outside the inverter using one of the signal connector conduit openings as shown in the figures below.



Code	Description
17	Electric Duct/Signal Wiring Conduit
18	DC Conduit Entry

Figure 3.21: Installing monitoring system via a RADIOMODULE

With the installation of the RADIOMODULE in the unit, apply the "FCC Label" supplied with the inverter and shown below the regulatory label. The FCC label contains the FCC mark and FCC ID of RADIOMODULE.



The monitoring is carried out using the PVI-DESKTOP device.

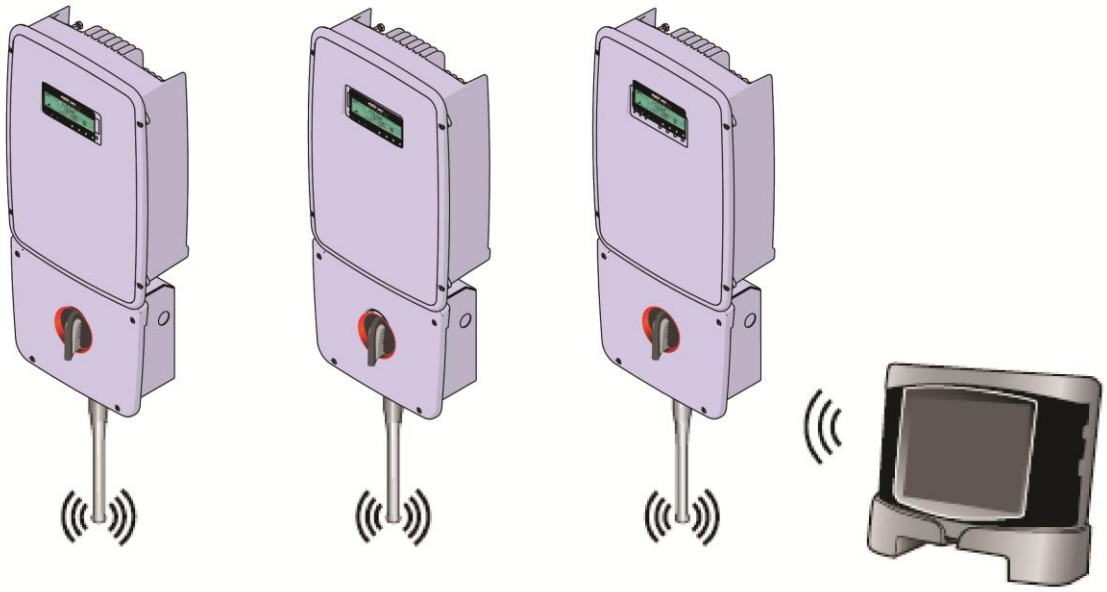


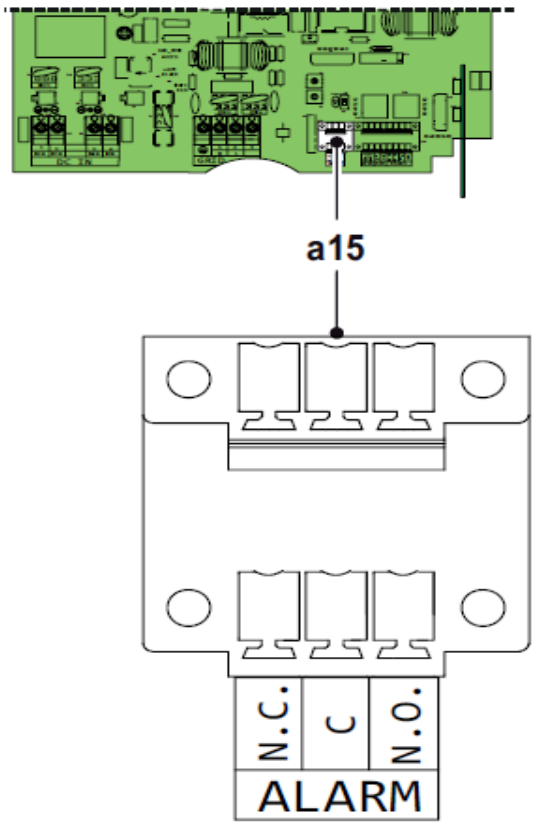
Figure 3.22: Monitoring using Power-One PVI-DESKTOP

10.20 CONFIGURABLE RELAY CONNECTION

The inverter has a user accessible, multi-function relay (a09) in Figure 3.20, that can be configured via front panel programming controls to operate in the four separate operating modes listed below.

The user has access to C contacts, which include a common connection, normally open (NO) and normally closed (NC) contact pairs.

This contact can be used in four different operating configurations that can be set in a dedicated menu.



NC = Normally closed
C = Common contact
NO = Normally open

Operating modes

• **Production**: the relay switches whenever a connection to (and therefore a disconnection from) the grid occurs. So if the "NO" (or "NC") contact is chosen, the contact will stay open (or closed) until the inverter is connected to the grid. Once the inverter connects to the grid and starts to export power, the relay switches state and therefore closes (or opens). When the inverter disconnects from the grid, the relay contact returns to its position of rest, namely open (or closed).

• **Alarm**: the relay switches whenever there is an alarm on the inverter (Error). No switching occurs when there is a Warning. So if the "NO" (or "NC") contact is chosen, the contact will stay open (or closed) until the inverter reports an error; once the inverter reports an error, the relay switches state and therefore closes (or opens). The contact remains switched from its rest condition until normal operation is restored.

• **Alarm** (configurable): the relay switches whenever there is an alarm (Error or a Warning), which have been previously selected by the user through the dedicated menu. If the "NO" (or "NC") contact is chosen, the contact will stay open (or closed) until the inverter reports an error or a warning out of those selected from the menu; once the inverter displays an Error or a Warning out of those selected, the relay switches state and therefore closes (or opens) the contact. The relay remains switched from its rest condition until the alarm or warning has disappeared.

• **Crepuscular**: (meaning: twilight) the relay usually switches when the voltage from the photovoltaic generator exceeds/falls below the threshold set for grid connection. If the "NO" (or "NC") contact is chosen, the contact will stay open (or closed) until the inverter has an input voltage higher than the one selected for grid connection. The contact remains switched from its rest condition for as long as the inverter is switched ON (even if it is not connected to the grid). This mode is useful for disconnecting large output transformers that could have unnecessary consumption during the night.

Code	Description
A15	Connection to the multi-function relay

Figure 3.23: Configurable relay connection

The device to be connected to the relay can be of different types (light, sound, etc) but must comply with the following requirements:

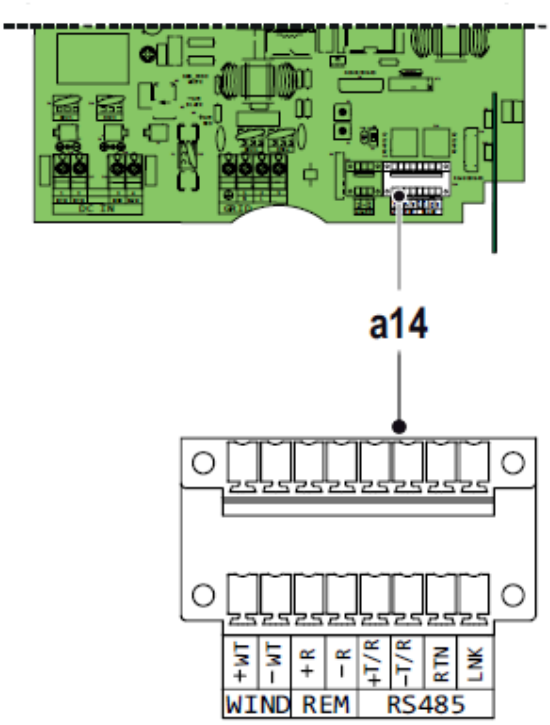
Alternating current

Maximum Voltage: 240 Vac Maximum Current: 1 A

Direct current

Maximum Voltage: 30 Vdc Maximum Current: 0.8 A

10.21 REMOTE CONTROL CONNECTION



Code	Description
A14	Speed sensor connections, remote control, RS485

Figure 3.24: Remote control connection

The connection and disconnection of the inverter to and from the grid can be controlled through an external control.

The function must be enabled in the associated Settings menu:

-When the function is disabled grid connection/disconnection of the inverter is dictated by the presence of the normal parameters.

- When the remote control function is enabled besides being dictated by the presence of the normal grid connect parameters connection/disconnection to the grid also depends on the state of the +R and -R terminals present on the connector (**a14) shown in** Figure 3.24 (a part of the main board (**05)** shown in Figure 3.15)

With the function enabled as noted above and :

* The +R and -R terminals open (floating) the inverter operates normally
* The +R and -R pins shorted together the inverter is disconnected from the grid and a "Remote Control OFF" message is shown on the display.

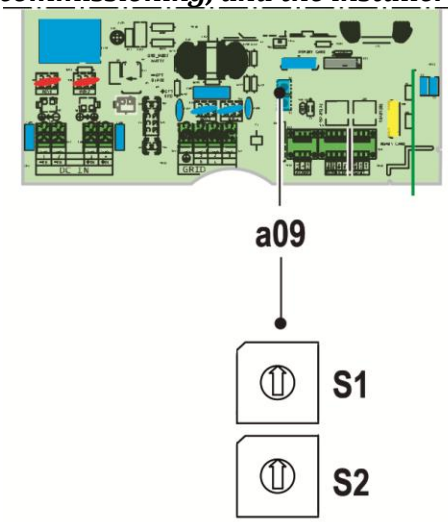
Since this is a low-level digital input, the wiring to the +R, -R terminals is typically small (#18AWG to #24 AWG).

Note: The external signal should be from a set of "dry" contacts - with no external voltage applied.

10.22 GRID STANDARD SETTING OF THE COUNTRY AND LANGUAGE DISPLAY

There are different grid parameters (dictated by the electric company) according to the country in which the inverter is installed. There are various grid voltages depending on the installation site. These parameters are programmed into the inverter using the rotary switches [S1, S2]as show in (a09), Figure 3.22.

Setting the grid standard for the country of installation is a necessary operation before commissioning, and the installer must know the correct standard to be configured.



The inverter is configured using the rotary switches (a09) Figure 3.25.

Before turning the rotary switches, make sure the inverter is switched OFF!

At the same time as the grid standard is set, **the language of the display menus** is also set.

Code	Description
a09	Rotary switches for setting the standard of the country and the language

Figure 3.25: Connection using the rotary switches to set the country grid standard.

The default setting is **0 / 0** and means no grid standard is selected and the display language is English (in this case, the "Set Country" message will appear on the display).

If a position of switches not assigned on the display (01) is selected, "Invalid Selection" appears.

10.23 SAVING GRID STANDARD OF THE COUNTRY AND LANGUAGE DISPLAY

The settings become fixed after 24 hours of operation of the inverter (it does not need to be connected to the grid, and only needs to be powered).
The time remaining before the settings become fixed can be seen in the dedicated menu, and a notice appears if the time has expired.

Once the settings are fixed, turning the rotary switches will produce no effect. In this condition, only the language can be changed through the dedicated menu.

At any time and for any reason, the ENGLISH language of the display menu can be set by simultaneously pressing the "ESC" and "ENTER" buttons for at least three seconds.
If it is necessary to change the standard of the country after the settings have been fixed (after 24- hours of operation) please contact Power-One's Technical Support department with the part number and serial number of the inverter.

PART 4: OPERATIONS GUIDE

11 GENERAL CONDITIONS

Before checking the operation of the equipment, it is necessary to have a thorough knowledge of the INSTRUMENTS chapter and the functions that have been enabled in the installation.
The equipment operates automatically without the aid of an operator; operating state is controlled through the instruments.

The interpretation or variation of some data is reserved exclusively for specialized and qualified staff.

The incoming voltage must not exceed the maximum values shown in the technical data in order to prevent damage to the equipment.

Consult Part 7: Appendix - Technical Data for further details.

During operation check that the environmental and logistic conditions are correct (see Part 3, Wiring).
Make sure that the said conditions have not changed over time and that the equipment is not exposed to adverse weather conditions and has not been contaminated with foreign bodies.

12 DISPLAY AND KEYPAD

12.1 DESCRIPTION OF SYMBOLS AND DISPLAY FIELDS

The operating parameters of the equipment are displayed through the display: warnings, alarms, channels, voltages, etc. During operation, the display behaves dynamically, which allows some information to be displayed cyclically (see Section 2.2 below).

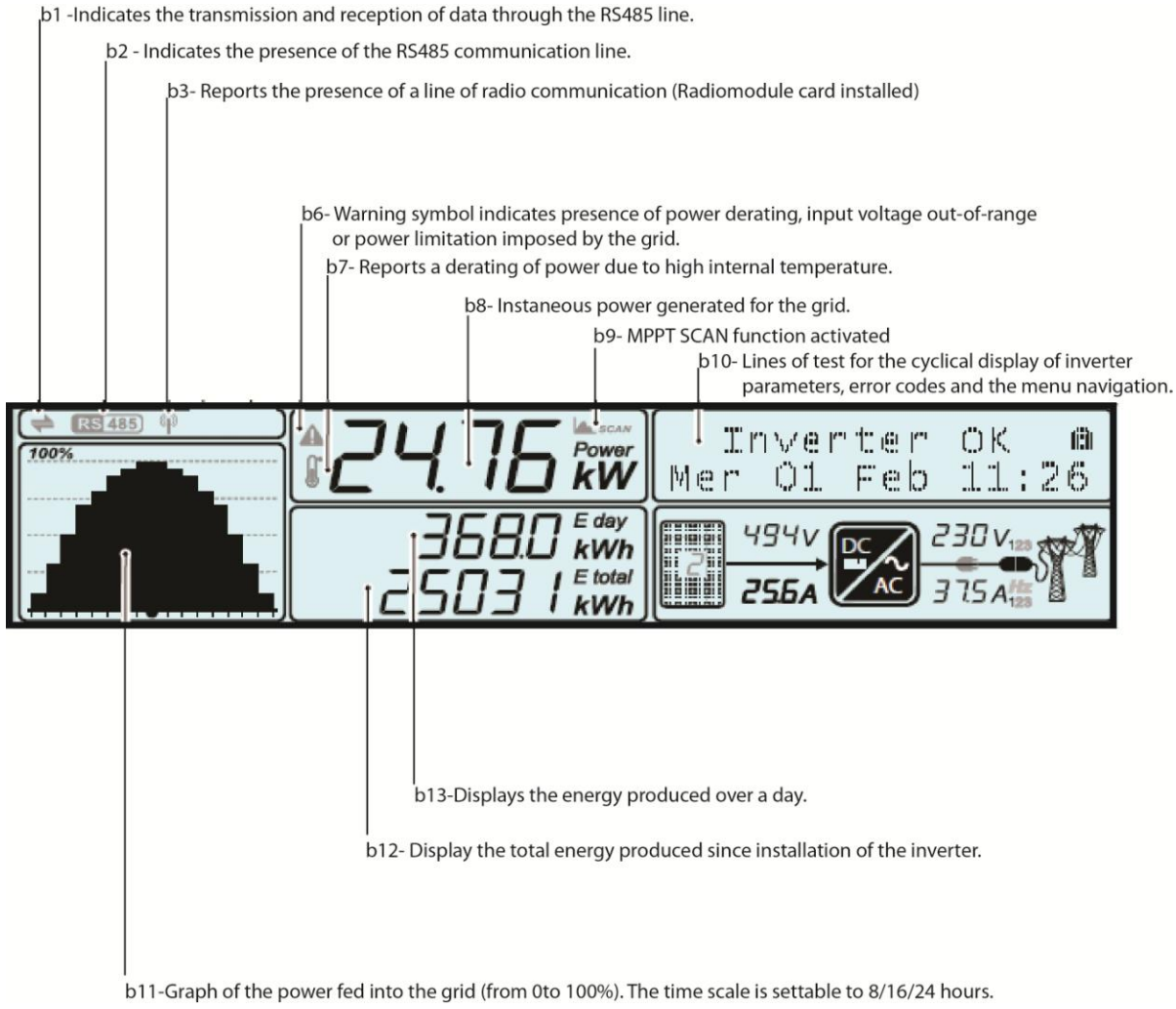


Figure 4.0: Description of symbols and display fields

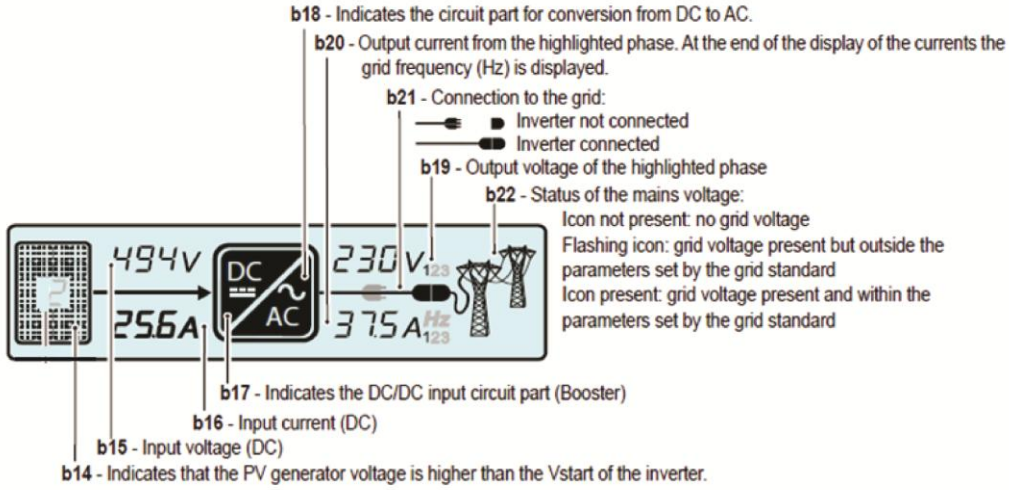


Figure 4.1: Description of symbols and display fields

12.2 DESCRIPTION OF THE KEYPAD

Through the combination of LED panel (02) buttons, under the display (01), in Figures 1.2 and 1.3 above values can be set or data can be displayed by scrolling up or down. Some LEDs are also shown on the keypad (03) in Figure 1.2 and 1.3 for status conditions. These references can be found in Figure1.2 and Figure 1.3 in System Architecture or see below for display screen shot.

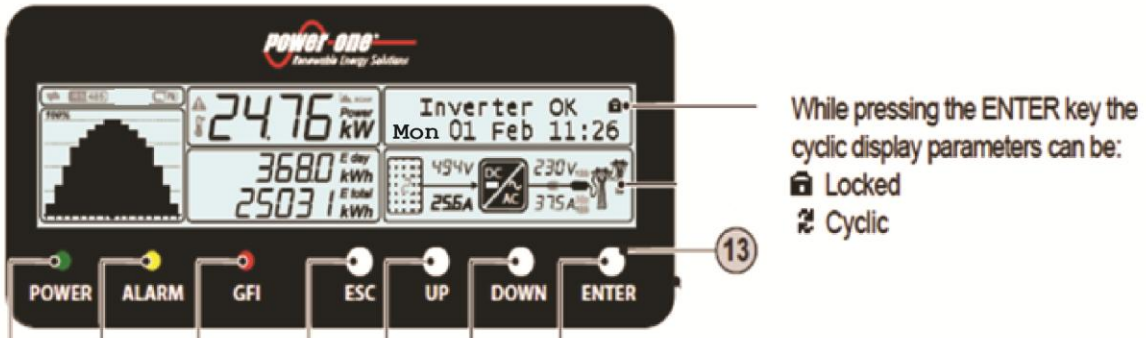


Figure 4.2: Description of the Keypad

The LEDs in the display indicate certain conditions by themselves. Using combinations of the LEDs they can indicate conditions that are different from the original single one; see the various descriptions given in Section 5 below.
The programming buttons all have specific functions when toggled independently but can also be used in various combinations as "shortcuts" that allow the user to perform alternative actions different from the functionality associated with a single button; see the various descriptions given in the manual.

13 MONITORING AND DATA TRANSMISSION

As a rule, the inverter operates automatically and does not require special checks. When there is not enough solar radiation to supply power for export to the grid, (e.g. during the night) it disconnects automatically.
In this mode data consultation on the display (01) in Figure 1.2 and 1.3 is possible (holding down any one key of the keypad (03) in Figure 1.2 and 1.3, the display is activated).The operating cycle is automatically restored when there is sufficient solar radiation. At this point, the luminous LEDs on the LED panel (02) in Figure 1.2 and 1.3 will indicate this state. These references can be found in Figure 1.2 and 1.3 in System Architecture or see below for display screen shot.

13.1 USER INTERFACE MODE

The inverter is able to provide information about its operation through the following instruments:
• Warning lights (luminous LEDs)
• LCD display for displaying operating data
•Data transmission on dedicated RS-485 serial line. The data can be collected by a PC (using the signal converter PVI-USB-RS485_232) or a data logger equipped with an RS-485 port (PVI-DESKTOP). Contact ***Power-One Service*** with any questions about the compatibility of the devices.

13.2 TYPES OF DATA AVAILABLE

The inverter provides two types of data, which are accessible through the appropriate interface software and/or through the display (01) in Figure 1.2 and 1.3.

Real-time operating data

Real-time operating data can be transmitted on request through the communication lines and are not recorded in the inverter. For data transmission to a PC, the free software supplied with the inverter can be used (please check at www.power-one.com for more updated versions).

Internally stored data

The inverter internally stores a set of data that are necessary for processing statistical data and an error log with time marking.

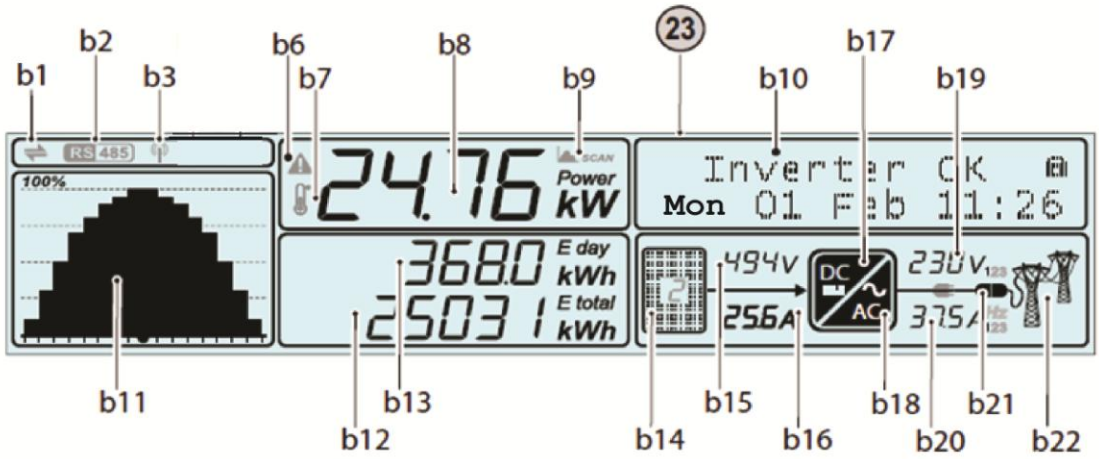
14 COMMISSIONING

Do not place objects of any kind on the inverter during operation!
Do not touch the heatsink while the inverter is operating!

WARNING: *Some parts may be very hot and cause burns*

Before proceeding with commissioning, make sure all checks and verifications indicated in the section on preliminary checks have been completed successfully.

WARNING:



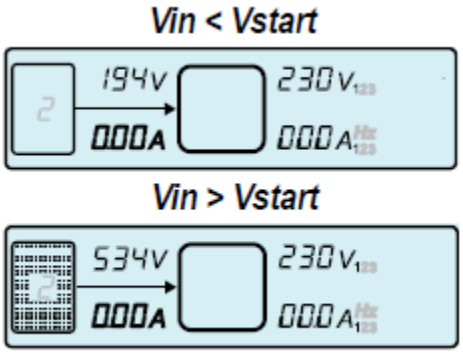
Code	Description	Code	Description	Code	Description
b1	Indicates the transmission and reception of data through the rs485 line.	b9	MPPT SCAN function activated.	b16	Input Current
b2	Indicates the presence of rs485 communication line.	b10	Lines of text for the cyclical display of inverter parameters, error codes and the menu navigation.	b17	Indicates the DC/DC input Circuit part (Booster).
b3	Indicates the presence of a line of radio communication (radiomodule card installed).	b11	Graph of the power fed into the grid (from 0 to 100%). The time scale is settable to 8/16/24 hours.	b18	Indicates the circuit part for conversation from DC to AC.
b6	Warning symbol indicates presence of power derating, input voltage out-of-range or power limitation impo the grid	b12	Displays the total energy produced since installation of the inverter.	b19	Output voltage of the highlighted phase
b7	Reports a derating of power due to high internal temperature.	b13	Displays the energy produced over a day.	b20	Output current fro the highlighted Phase. At the end of the display of the currents the grid frequency (Hz) is

					displayed.
b8	Instaneous power generated for the grid.	b14	Indicates that the PV generator voltage is higher than the VStart of the inverter.	b21	Connection to the grid: Connected (together) Not connected (gapped)
		b15	Input voltage	b22	Status of the mains voltage: Icon not present: No Grid voltage Flashing Icon: Grid voltage present but outside the parameters set by the grid standard Icon present: grid voltage present and within the parameters set by the grid standard.

Figure 4.3 Types of data available on the display

14.1 COMMISSIONING PROCEDURE

• Turn the DC disconnect switch (07) in Figure 1.2 and 1.3 in the ON position. If there are two separate external disconnect switches (one for DC and the other for AC), first close the AC disconnect switch and then the DC disconnect switch. There is no order of priority for opening the disconnect switches.

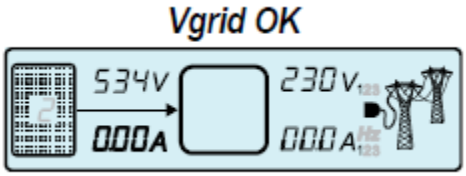


When the inverter has power, the first checks performed are associated with the input voltage:

- If the DC input voltage is **lower** than the Vstart voltage (voltage required to begin the inverter's grid connection) the (b14) in Figure 4.3 icon remains OFF and the "Waiting for the sun" message is displayed (b10) in Figure 4.3.

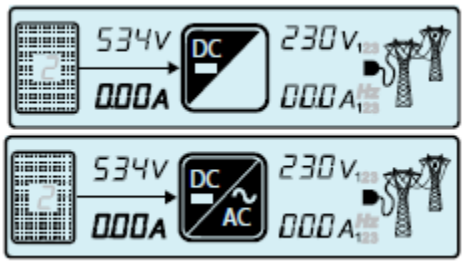
- If the DC input voltage is **higher** than the Vstart voltage the (b14) in Figure 4.3 icon is displayed and the inverter goes to the next stage of the controls.

In both cases the voltage levels and input current indicated in the display are (b15) and (b16) in Figure 4.3 fields.

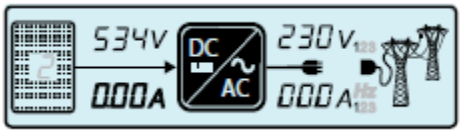


• The inverter performs a control of grid parameters. The b22 icon, which represents the grid distribution, can have different statuses:

- Not present- indicates the mains voltage results as absent.
- Flashing – indicates the mains voltage is present but outside the parameters dictated by the



Inverter not connected in network



Inverter connected to a network

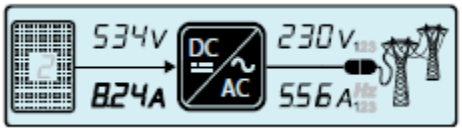


Figure 4.4: commissioning procedure screen shots

standard of the country of installation.

- Turns ON -if the mains voltage is present and within the parameters dictated by the standard of the country of installation. In this condition, the inverter starts the sequence of grid connection.

The above verification can take several minutes (from a minimum of 30 seconds up to several minutes), depending on grid conditions and settings relative to the standard of the country

• At this point the (b17) in Figure 4.3 icon will flash; this indicates the start-up of the DC-DC circuit (booster) part. This icon will remain permanently switched ON when the DC-DC will be operating at steady state (the flashing of the icon usually lasts a few seconds).

Immediately after this, the (b18) in Figure 4.3 icon, which indicates the AC-DC circuit (inverter) part, will turn ON normally.

• Immediately thereafter this the grid connection will start. During this phase the icons will be displayed in sequence on the (b21) in Figure 4.3 until the connection of the inverter is complete. After the inverter is connected, the icons on the whole line (b21) will come ON steady.

If the inverter disconnects from the grid, the icons of the left side (cable and plug) of the line (b21) will stay ON.

• Once the connection sequence has been completed, the inverter starts to operate and indicates its correct operation by the green LED coming on steady on the LED panel (02). This means there is sufficient solar radiation to feed power into the grid.

• If the results of the grid condition check do not yield a positive result, the unit will repeat the procedure until all the parameters controlling connection to the grid (grid voltage and frequency, insulation resistance) are within the range. During this procedure, the green LED flashes ON and OFF.

After initial connection to the grid is made, the wiring box must be configured using the dedicated Aurora Manager Software. The software and relevant manual for carrying out this configuration are contained in the CD supplied with the inverter.

14.2 DISPLAY ACCESS AND SETTINGS

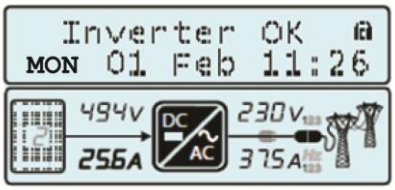
After commissioning the inverter, it is necessary to set the configuration of the inverter by accessing the “Account Settings” from the display. The following list contains the main adjustable parameters (see “Menu descriptions” in Section 5.3 below).

• **Address RS485:** Access menu to allow changing the RS485 address (required in the case of communication bus for system monitoring).
• **Vstart:** Re-access the Vstart parameter which may need to be adjusted when short strings are used in the PV array.
• **MPPT scan:** Enables the inverter to carry out a search for the maximum power point with sensitivity and adjustable time intervals ("MPP" parameter).
• **Analog inputs setting (if any):** Allows access to setting the parameters associated with the analog sensors connected as the input ("Analog Inputs").
• **Input Strings (where present):** Allows access to carry out checks on the status of the fuses and on the current imbalance of the strings present in the input ("Fuse control" parameters).
• **Reactive power input setting (where present):** Allows access to settings necessary to manage the reactive power input into the grid in different ways ("Reactive Power parameter")
• **Limitation active power setting (where present):** Allows access to settings necessary to set a limit on active power output of the inverter ("Power reduction" parameter)

14.3 DYNAMIC BEHAVIOR OF THE DISPLAY

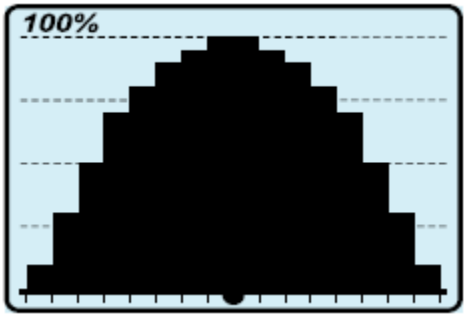
• If the MPPT scan function is enabled, icon (b9) will be shown on the display. See configuration in the MPPT settings menu section. This icon will flash during scanning
• During operation, the following values are displayed in rotation:

- Voltage and current [(b15) and (b16) Figure 4.3] from the photovoltaic generator. According to the configuration or model of the inverter, the voltages and currents of one or both channels (or of the single strings) will be displayed. The input channel considered is indicated by the value entered on icon (b14) Figure 4.3.
- Voltage and current [(b19 and (b20) Figure 4.3] on the various phases. According to the model of inverter, the voltages and currents of one (1) or three phases (1, 2, and 3) will be displayed. The phase considered is shown on the right side of the voltage and current values.



At the end of the display cycle, as described above, the grid frequency will be indicated in field (b20) Figure 4.3 and the line voltage will be indicated in field (b19) Figure 4.3. At the same time, the main readings made by the inverter will be displayed in rotation on the graphic display (b10) Figure 4.3.

Display of the power graph (**b11)**



The histogram includes 16 horizontal units and 20 vertical units.
The period of time is represented by the horizontal axis of the graph and can be set by the user to 8, 16 or 24 hours; therefore, each horizontal unit can represent 30, 60 or 120 minutes.
The vertical axis represents the maximum power derating (2.2kW for the UNO-2.0-I-OUTD and 2.75kW for the UNO-2.5-I-OUTD) and therefore 100% corresponds to this outgoing exported power value.
Finally, bear in mind that the power value expressed by each column of the graph represents the average value of the power during the period relating to the horizontal unit.

15 LED BEHAVIOR

The following table shows all the possible combinations of activation of the LEDs, situated on the LED panel (02)**, i**n Figure 1.2 and 1.3 in relation to the operating state of the inverter.

● = LED on
◒ = LED flashing
⊗ = LED off
(x) = Any one of the conditions described above

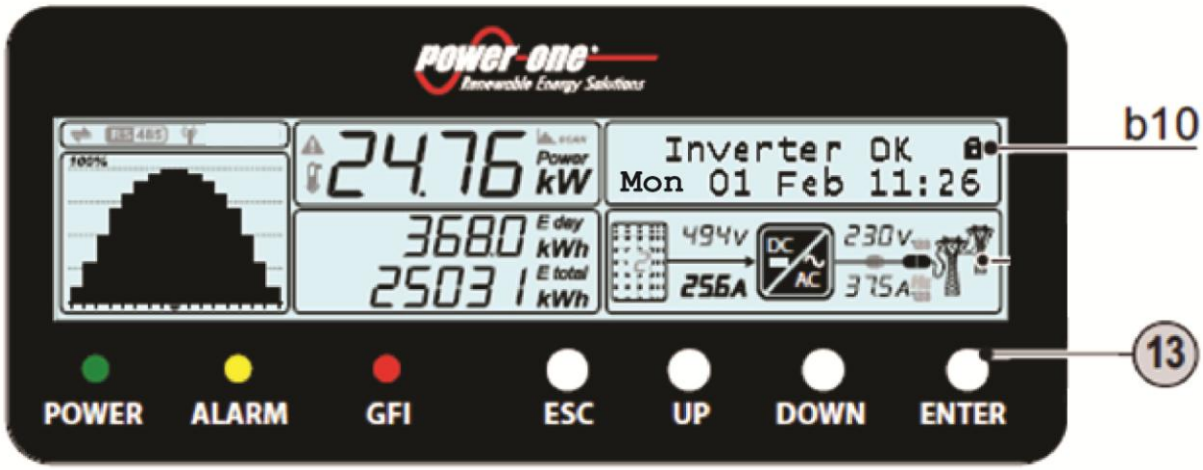
Status of the LED:	Operating state:	Notes:
Green: ⊗ Yellow: ⊗ Red: ⊗	Sleep-mode (auto switch-OFF of the inverter)	The inverter is in sleep-mode (input voltage 70% less than the start-up voltage set for both inputs). Green LED flashes for 0.25s, once every 10s.
Green: ◒ Yellow: ⊗ Red: ⊗	Inverter initialization (loading of setting and wait for grid check)	This is a transition state due to the checking of the operating conditions. During this phase, the input power is sufficient and the inverter checks the conditions necessary for connection to the grid (for example: value of the input voltage, value of the insulation resistance, etc.). Green LED flashes for 0.5s, once every 1s.
Green: ● Yellow: ⊗ Red: ⊗	The inverter is connected and feeds power into the grid.	The machine is operating normally. During this phase, the inverter automatically carries out a research and analysis of the maximum power point (MPP) available from the photovoltaic generator.
Green: (x) Yellow: (x) Red: ●	Anomaly in the insulation system of the photovoltaic generator	The inverter indicates that too low an insulation resistance (RISO) has been detected (presence of a leakage to ground of the PV generator) and feeds the power extracted from the photovoltaic generator into the grid. The problem may be connected with an insulation fault in the PV modules or in the connections (DC side).
Green: ⊗ Yellow: ● Red: ⊗	We have: Anomaly (warning: W warning codes) Error (error: E warning codes)	Whenever the control system of the inverter detects an anomaly (W) or fault (E) in the operation of the monitored system, the yellow LED comes on steady and a message indicating the type of problem found appears on the display 01. The error can be inside or outside the inverter (see Alarm messages).
Green: ⊗ Yellow: ◒ Red: ⊗	Internally ventilation anomaly	Indicates an operating anomaly in the internal ventilation. This does not cause much of a problem to the inverter because the fan starts only at hight temperatures combined with high output powers.
Green: ◒ Yellow: ● Red: ⊗	Disconnection from the grid	Indicates that the grid voltage for allowing the inverter to connect to the grid is not present. The inverter shows the NO Vac message on the display.

Table 6: LED Behavior

In the event of malfunctioning, it is extremely dangerous to try to eliminate the fault personally. The instructions given below must be strictly followed; if you do not have the experience and necessary qualification to work safely, please contact a specialized technician.

15.1 SPECIFICATIONS ON THE BEHAVIOR OF THE LEDS

Next to each state of the inverter, indicated through the steady or intermittent lighting of the relevant LED, a message that identifies the operation it is carrying out or the detected fault/anomaly is also shown on the display 01, section (b10), (see below).



Code	Description	Code	Description
b10	Lines of text for the cyclical display of inverter parameters, error codes and the menu navigation	13	Display Keypad

Figure 4.5: Specifications on the behavior of the LEDs

15.2 INSULATION FAULT LED

Procedure following insulation-fault warning:

When the red LED comes ON first try to reset the warning through the multi-function button ESC on the LED panel (02).

If the inverter duly reconnects to the grid, the fault was due to temporary phenomena. Power- One recommends having the system inspected by the installer or a specialized technician if this malfunctioning occurs frequently.

If the inverter does not reconnect to the grid, make it safe by isolating it (by means of the disconnect switches) on both the DC side and the AC side, and then contact the installer or an authorized service center to have the photovoltaic generator fault repaired.

15.3 DESCRIPTION OF THE MENUS

The display (01) in Figure 1.2 and 1.3 has a section (b10) In Figure 4.3 (graphic display) for moving through the menu using the buttons of the LED panel (02) in Figure 1.2 and 1.3. Section (b10) in Figure 4.3 consists of two lines with 16 characters per line and can be used to:

- display the operating state of the inverter and the statistical data;
- display the service messages for the operator;
- display the alarm and fault messages for the operator;
- changing the settings of the inverter.

15.4 USING THE PANEL BUTTONS

- The UP and DOWN buttons of the LED panel (**02)** in Figure 1.2 and 1.3 are used to move around a menu or to increase/decrease the settable values.
- The ESC button allows access to the three main sub-menus, STATISTICS, SETTINGS and INFORMATION.

This enables the user to return to the previous sub-menu while moving through the menus.

- The ENTER button allows access to the required sub-menu while moving though the menus and allows the main menu scroll mode to be changed (icons (**b23)** in Figure 4.3 are activated):

CYCLIC: Cyclic display of the main parameters of the inverter.

LOCKED: Display locked on the screen you want to monitor continuously

15.5 STATISTICS MENU

Selecting STATISTICS from the three main sub-menus gives access to:

- **Total -***This section of the menu allows users to display the total statistics*:

Time: Total operating time
E-tot: Total energy produced
Val.: Total production value, calculated with the currency and conversion coefficient set in the relevant section of the SETTINGS menu.
CO2: Amount of CO2 saved compared to fossil fuels

- **Partial -***This section of the menu allows users to display the partial statistics:*

Time: Partial operating time
E-par: Partial energy produced
PPeak: Peak power value
Val.: Partial production value, calculated with the currency and conversion coefficient set in the relevant section of the SETTINGS menu .
CO2: Partial amount of CO2 saved
* To reset all the counters of this sub-menu, press the ENTER button for more than three seconds.

- **Today -***This section of the menu allows users to display the daily statistics:*

E-day: Daily energy produced
Ppeak: Daily peak power value
Val.: Daily production value, calculated with the currency and conversion coefficient set in the relevant section of the SETTINGS menu.
CO2: Amount of CO2 saved daily

- **Last 7 days** -*This section of the menu allows users to display the statistics for the last seven days*:

E-7d: Energy produced over the last seven days

Val.: Value of production for the last seven days, calculated with the currency and conversion coefficient set in the relevant section of the SETTINGS menu .
CO2: Amount of CO2 saved over the last seven days

• **Last month -**This section of the menu allows users to display the statistics for the last month:
E-mon: Energy produced during the current month
Val.: Value of production for the last month, calculated with the currency and conversion coefficient set in the relevant section of the SETTINGS menu.
CO2: Amount of CO2 saved during the current month

• **Last 30 days:** This section of the menu allows users to display the statistics for the last 30 days:
E-30d: Energy produced over the last 30 days
Val.: Value of production for the last 30 days, calculated with the currency and conversion coefficient set in the relevant section of the SETTINGS menu.
CO2: Amount of CO2 saved over the last 30 days

• **Last 365 days -**This section of the menu allows users to display the statistics for the last 365 days:
E-365: Energy produced over the last 365 days
Val.: Value of production for the last 365 days, calculated with the currency and conversion coefficient set in the relevant section of the SETTINGS menu.
CO2: Amount of CO2 saved over the last 365 days

• **User period -**This section of the menu allows the statistics for a period selected by the user to be displayed:
Once the start and end dates for the period has been set, the following data are available:
E: Energy produced during the selected period
Val.: Value of production for the selected period, calculated with the currency and conversion coefficient set in the relevant section of the SETTINGS menu.
CO2: Amount of CO2 saved during the selected period

15.6 SETTINGS MENU

When SETTINGS is selected from the three main sub-menus, the first screen for the password is displayed in the display. **The default password is "0000".**
This can be changed using the display buttons, always following the same procedure:
• Use ENTER to scroll the digits (from left to right)
• Use ESC to return to the previous digit (from right to left)
• Press ESC several times to return to the previous menus
• Use DOWN to progressively scroll the numerical scale downwards (from 9 to 0)
• Use UP to progressively scroll the numerical scale upwards (from 0 to 9)
After entering the password, press ENTER to access the information gathered in this section:

• **Address -**This section of the menu allows you to set the address for the serial communication of single inverters connected to the RS485 line.
The addresses that can be assigned are 2 to 63. Use the UP and DOWN buttons to scroll the numerical scale. At present, the 'AUTO' selection cannot be used

• **Display Setting** -This section of the menu allows users to set the characteristics of the display:
1. Light: setting of the mode and adjustment of the brightness of the display
Mode:

ON: Light always ON
OFF: Light always OFF
AUTO: Automatic light control. The light comes ON whenever a button is pressed and stays on for 30 sec, after which it gradually goes out.
Intensity: Adjustment of display brightness (scale from 1 to 9)
2. Contrast*:* Adjustment of display contrast (scale from 1 *to 9)*
3. Buzzer*:* Button sound setting
ON: The sound of the buttons is activated
OFF: the sound of the buttons is deactivated
4. Power Graph: Allows users to set the time scale of the power graph (8/16/24h)

• **Service** -This section of the menu is reserved for installers. To access this area requires the extended password specific to this inverter. Contact Power-One Technical Service to obtain this password.

New PW -This section of the menu allows users to change the password for accessing the settings menu (default 0000).

We ADVISE users to be very careful in memorizing the new password.
If the Password is misplaced, it will not be possible to access the inverter, since there is no Reset function for security reasons.

Accessing the Service Menu:

Contact Power-One Technical Service to get the extended service password. This password is specific to the respective inverter. It will enable customers to gain access to the parameters available in the Service Menu.
Using the UP and DOWN arrows, enter the password obtained from the Power-One Technical Service.

Press *ENTER.*

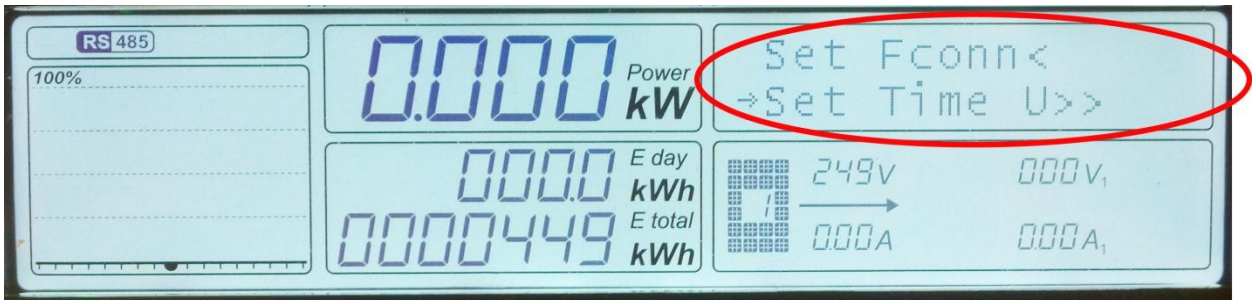


Figure 4.6: Display when entering extended service menu

The follow the settings in the red circle
1: *Set U>>: Indicates the absolute maximum value of the Over Voltage setpoint

NOTE: The default setting is 120% of Vnom.

To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Set U<<** Indicates the absolute minimum value of the Under Voltage setpoint

NOTE: The default setting is 50% of Vnom.

To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Set F>>** Indicates the value of absolute maximum Over Frequency setpoint.

NOTE: The default setting is 60.5Hz.

To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Set F<<** Indicates the value of absolute minimum allowable Under Frequency setpoint

NOTE: The default setting is 59.3Hz

To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Set U>** Indicates the value of the intermediate Over Voltage setpoint

NOTE: The default setting is 110% of Vnom.

To change:

Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Set U<** Indicates the value of the intermediate **Under Voltage setpoint**

NOTE: The default setting is 88% of Vnom.

To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Set F>** Indicates the value of the intermediate **Over Frequency setpoint**.

NOTE: The default setting of this inverter is 60.5 Hz
To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Set F<** Indicates the value of the intermediate **Under Frequency setpoint**.

NOTE: The default setting is 59.3Hz.

To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Set Uconn>** Indicates the maximum and minimum grid voltage value for connection to the grid.
Press *ENTER*
***Max Uconn>**
NOTE: this is the default setting of this inverter is to be determined.

To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save

Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Set Uconn<**
Press *ENTER*
***Min Uconn<**
NOTE: this is the default setting of this inverter is to be determined.

To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Set F Conn>** This indicates the maximum and minimum grid frequency value for connection to the grid.
Press *ENTER*
***Max F Conn>**
NOTE: This is the default setting of this inverter is to be determined.

To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Set F Conn<**
Press *ENTER*
*** F Conn <**
NOTE: this is the default setting of this inverter is to be determined.

To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Set Time U>>** This indicates the Protection Trip Time associated with the absolute value of the **Over Voltage setpoint.**
Press *ENTER*
*** Time Max U>>**
NOTE: The default setting is 0.16 seconds.

To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save

Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Set Time U<<** Indicates the Protection Trip Time associated with the absolute value of the **Under Voltage setpoint.**
Press *ENTER*
*** Time Min U<<**
NOTE: The default setting is 0.16 seconds.

To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Set Time F>>** Indicates the protection trip time associated with the absolute value of the **Over Frequency setpoint.**
Press *ENTER*
*** Time Min F>>**
NOTE: The default setting is 0.16 seconds.
To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Set Time U>** Indicates the protection trip time associated with the intermediate value of the **Over Voltage setpoint.**
Press *ENTER*
*** Time Max U>**
NOTE: The default setting is 1 second.
To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Set Time U<** Indicates the protection trip time associated with the intermediate value of the **Under Voltage set point.**
Press *ENTER*
*** Time Min U<**

NOTE: The default setting is 2 seconds.

To change:
Use the UP/DOWN arrows on the display panel to change the value.

Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Set Time F>** Indicates the protection trip time associated with the intermediate **Under Frequency setpoint.**
press *ENTER*
*** Time Max F>**

NOTE: The default setting is 0.16 seconds.

To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Set Time F<** Indicates the protection trip time associated with the intermediate **Over Frequency Setpoint.**
Press *ENTER*
*** Time Min F<**
NOTE: The default setting is 0.16 seconds.

To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Set Time Conn 1** Indicates the time the inverter takes to connect the grid for the first time (not after grid fault)
Press *ENTER*
*** Time Conn 1**
NOTE: The default setting is 30 seconds.

To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Set Time Conn 2** Indicates the time the inverter takes to connect to the grid after a grid fault.
Press *ENTER*
*** Time Conn 2**
NOTE: The default setting is 300 seconds. This is the default setting of this inverter.
To change:

Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Disable U>>** This functionality allows user to enable/disable the absolute **Over Voltage Protection** feature.
Press *ENTER*

*** U>> Protection**
Enable

NOTE: this is the default setting of this inverter.
To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Disable U<<** This functionality allows to enable/disable the **Absolute Voltage Protection** feature.
Press *ENTER*

***U<< Protection**
Enable

NOTE: this is the default setting of this inverter.
To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Disable F>>** This functionality allows to enable/disable the **Absolute Over Frequency Protection** feature.
Press *ENTER*

*** F>> Protection**
Enable

NOTE: this is the default setting of this inverter.
To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Disable F<<** This functionality allows to enable/disable the **Absolute Under Frequency Protection** feature.
Press *ENTER*

*** F<< Protection**

Enable
NOTE: this is the default setting of this inverter.

To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Disable U>** This functionality allows enable/disable the **Intermediate Overvoltage Protection** feature.
Press *ENTER*
***U> Protection**
Enable
NOTE: this is the default setting of this inverter.
To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Disable U<** This functionality allows user to enable/disable the **Intermediate Under Voltage Protection** feature.

Press *ENTER*
*** U< Protection**
Enable
NOTE: this is the default setting of this inverter.
To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Disable F>** This functionality allows to enable/disable **the Intermediate Over Frequency Protection** feature.
Press *ENTER*
*** F> Protection**
Enable
NOTE: this is the default setting of this inverter.

To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save

Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Disable F<** This functionality allows user to enable/disable **the Intermediate Under Frequency Protection** feature.
Press *ENTER*

*** F< Protection**
Enable

NOTE: this is the default setting of this inverter.

To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Slow Ramp** Slow Ramp (Soft Start) indicates the output power ramp at connection. This feature can enable or disable this function.
Press *ENTER*

***Slow Ramp**
Disabled

NOTE: this is the default setting of this inverter.

To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***U Avg Derating** This function enables/disables the inverter's active power limitation so that it avoids the average grid voltage from overcoming the threshold value and causing the inverter disconnection from the grid.
Press *ENTER*

***U Avg Derating**
Enable

NOTE: this is the default setting of this inverter.

To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***OF Derating** This function enables/disables the power limitation feature due to high-grid frequency.
Press *ENTER*

***OF Derating**

Disabled
NOTE: this is the default setting of this inverter.

To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Reset Country _S** This function can be used to reset the country code.
Press *ENTER*
To change:
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

***Accept Boards** This function can be used to force new boards link (in case of board substitution/converter part)
Press *ENTER*
Use the UP/DOWN arrows on the display panel to change the value.
Once the correct value has been selected:
Press *ENTER* to save
Press *ENTER* to confirm the change
Press *ESC or ENTER to* exit the menu

• **Cash** This section of the menu allows users to set the name of the currency and the value given to 1 kWh of energy produced. The correct setting of these parameters allows users to display the actual earning/saving given by the system. **Name:** the chosen value is set (default is US)
Val/KWh: indicates the cost/incentive of 1 KWh expressed in the chosen currency (default is 0.10).

• **Time -**Allows users to set the current date and time (daylight saving time not included)

• **Language -**Allows users to set the required menu language

• **Vstart** This section of the menu allows users to set the Vstart voltage

The activation voltage should only be adjusted if required by the array design. The proper setting for a given array can be determined from the Power-One string sizing tool, available at www.power-one.com

• **Autotest -**After the Autotest procedure, the following information is available:
- Nominal threshold (set in the inverter)
- Value of the quantity found during autotest
- Nominal operation time (set in the inverter)
- Operation time found

If the test is not passed, the machine stops until the test is passed.
The tests that can be carried out are the following:
Max Voltage: Disconnection from the distribution grid for "Overvoltage" operable on the single phase (single phase models) or on the three phases R, S and T (three-phase models).
Min Voltage: Disconnection from the distribution grid for "Overvoltage" operable on the single phase (single phase models) or on the three phases R, S and T (three-phase models).
Max Frequency: Disconnection from the grid due to "Over Frequency"
Min Frequency: Disconnection from the grid due to "Under Frequency"

• Alarm
This section of the menu allows you to set the switching of a relay contact (available as a normally open contact – "N.O." – and also as a normally closed contact – "N.C."). This contact can be used, for example, to: activate a siren or a visual alarm, control the disconnect device of an external transformer, or control an external device. Maximum ratings of the alarm contact: 240Vac/1A and 30Vdc/0.8A
The switching of the relay can be set in four different modes:
PRODUCTION: the relay switches when the inverter connects to the grid.
ALARM: the relay switches when there is an alarm (code E).
ALARM (conf.): the relay switches if there are alarms (code E) or warnings (code W) chosen by the user from a list (the list may also show choices that are not seen for the specific model).
CREPUSCULAR: the relay switches only when it exceeds the input voltage set for connection to the grid.

Remote ON/OFF
This section of the menu allows you to enable/disable the connection/ disconnection of the inverter to/from the grid through the relevant control signal (+R/-R).
Disable: the connection/disconnection of the inverter to/from the grid is dictated by the input (voltage from the photovoltaic generator) and output (grid voltage) parameters of the inverter.
Enable: the connection/disconnection of the inverter to/from the grid is dictated by the state of the +R signal compared to the -R signal as well as by the input (voltage from the photovoltaic generator) and output (grid voltage) parameters of the inverter.

• Sleep Mode
This functionality turns OFF the inverter completely and the power absorption is reduced to a minimum (0.6W).
In this mode, the inverter allows display of the information available even in the absence of input voltage and therefore in the absence of sufficient irradiation of the photovoltaic panels. In fact, the display can be "awakened" by pressing any button on the display with the exception of the ESC button.
After 30 seconds of inactivity the display will once again switch OFF automatically.

Enabled: (DEFAULT)
Disabled:

• UV prot. Time
This section of the menu allows you to set the time for which the inverter stays connected to the grid after the input voltage has dropped below the Under Voltage limit (set at 70% of Vstart).
Power-One sets the time at 60 sec. The user can set it at from 1 to 3600 sec.
Example: with the UV Prot.time set at 60 seconds, if the Vin drops below 70% of Vstart at 9:00, the inverter stays connected to the grid (taking power from it) until 9:01.

• **MPPT**
This section of the menu allows you to set the parameters of the Maximum Power Point Search (Tracking) (MPPT) function. This function is useful when there are shadowed areas on the photovoltaic generator that can create several maximum power points in the work curve.
MPPT amplitude: the amplitude of the interference introduced in DC is chosen through the setting of this parameter to establish the optimal working point. There are three settings to choose from (LOW, MEDIUM, and HIGH). The default setting is MEDIUM.
Multi-max scan: through the setting of this parameter, you can enable/ disable the scan, decide the frequency with which the scan is carried out and override it manually.
Enable/Disable: Enables/Disables the scan for identifying the maximum power point of the system.
Scan Interval: this allows you to set the interval of time between scans. It must be kept in mind that, the shorter the interval between scans, the greater the loss of production because during the scan, energy is transferred to the grid but not at the maximum power point. Each scan takes two seconds.

15.7 INFORMATION MENU

• **Part No:** Allows users to display the product identification code.

• **Serial No**.: Allows users to display the serial number of the equipment.

• **Firmware:** Allows users to display the revision of the firmware installed in the equipment.

• **Country selector:** Allows users to display information regarding the grid standard set with the rotary selectors.
- ***Current value***: Displays the set grid standard.
- ***New value*****:** If the position of the rotary switches is changed (a new grid standard is therefore selected) during operation, the new standard selected will be displayed but will be made effective only after the equipment has been switched OFF and then ON again and only if the time remaining for carrying out this operation has not expired (24h of operation).
- ***Set new***: Allows users to confirm/set the new grid standard set in the "New value" section of the previous menu. When this function is used, there will be no correspondence between the standard selected on the display and the position of the rotary selectors.
- ***Time remaining*****:** Displays the time remaining in which it is still possible to set a new grid standard. When the time expires, "Locked" will be displayed, which indicates it is not possible to change the grid standard again.

PART 5: TROUBLESHOOTING

16 TROUBLESHOOTING

16.1 LED BEHAVIOR

The following table shows all the possible combinations of activation of the LEDs, situated on the LED panel (02) in relation to the operating state of the inverter.

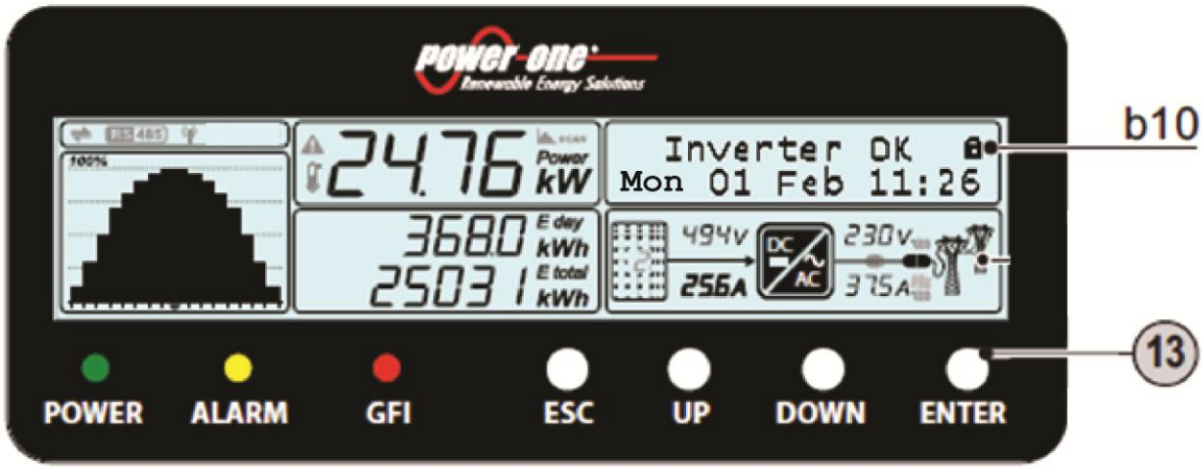
● = LED on
◒ = LED flashing
⊗ = LED off
(x) = Any one of the conditions described above

Status of the LED:	Operating state:	Notes:
Green: ⊗ Yellow: ⊗ Red: ⊗	Sleep-mode (auto switch-OFF of the inverter)	The inverter is in sleep-mode (input voltage 70% less than the start-up voltage set for both inputs). Green LED flashes for 0.25s, once every 10s.
Green: ◒ Yellow: ⊗ Red: ⊗	Inverter initialization (loading of setting and wait for grid check)	This is a transition state due to the checking of the operating conditions. During this phase, the input power is sufficient and the inverter checks the conditions necessary for connection to the grid (for example: value of the input voltage, value of the insulation resistance, etc.). Green LED flashes for 0.5s, once every 1s.
Green: ● Yellow: ⊗ Red: ⊗	The inverter is connected and feeds power into the grid.	The machine is operating normally. During this phase, the inverter automatically carries out a research and analysis of the maximum power point (MPP) available from the photovoltaic generator.
Green: (x) Yellow: (x) Red: ●	Anomaly in the insulation system of the photovoltaic generator	The inverter indicates that too low an insulation resistance (RISO) has been detected (presence of a leakage to ground of the PV generator) and feeds the power extracted from the photovoltaic generator into the grid. The problem may be connected with an insulation fault in the PV modules or in the connections (DC side).
Green: ⊗ Yellow: ● Red: ⊗	We have: Anomaly (warning: W warning codes) Error (error: E warning codes)	Whenever the control system of the inverter detects an anomaly (W) or fault (E) in the operation of the monitored system, the yellow LED comes on steady and a message indicating the type of problem found appears on the display 01. The error can be inside or outside the inverter (see Alarm messages).
Green: ⊗ Yellow: ◒ Red: ⊗	Internally ventilation anomaly	Indicates an operating anomaly in the internal ventilation. This does not cause much of a problem to the inverter because the fan starts only at hight temperatures combined with high output powers.
Green: ◒ Yellow: ● Red: ⊗	Disconnection from the grid	Indicates that the grid voltage for allowing the inverter to connect to the grid is not present. The inverter shows the NO Vac message on the display.

Table 7: LED Behavior

16.2 SPECIFICATIONS ON THE BEHAVIOR OF THE LEDS

The equipment is able to indicate errors/warnings on the display only if the input voltage is higher than the Vdc min voltage (POWER LED flashing or ON; see Part 4: Operation).
Next to each state of the inverter, indicated through the steady or intermittent lighting of the relevant LED, a message that identifies the operation it is carrying out or the detected fault/anomaly is also shown on the display **01**, section (**b10)**, (see below).



Code	Description	Code	Description
b10	Lines of text for the cyclical display of inverter parameters, error codes and the menu navigation	13	Display

Figure 5.1 Inverter display

16.3 MESSAGES AND ERROR CODES

Message Display	Display Codes	Alarm	Cause	Solution	Message Display
Ground Fault	Red LED	Ground Fault	The alarm is generated when a ground leakage current is detected in the DC section of the system. The alarm is accompanied by the lighting up of the red LED on the front of the inverter.	If possible, measure the installation resistance using a megohmmeter positioned between the photovoltaic field (positive terminal short-circuited to the negative pole) and ground. If the measured value is less than 1megohm, the photovoltaic generator must be checked by a technician/ installer to identify and eliminate the problem. If measured value is greater than 1 megaohm	Ground Fault

				and the error warning continues to be present, contact the **Power-One Service Department.**	
Degauss error	-	Degaussing State Fail			Degauss error
Input OC	E001	Input Overcurrent	The alarm appears when the inverter input current exceeds the set overcurrent threshold.	You must check whether the composition of the PV generator allows an input current that exceeds the maximum threshold allowed by the inverter and that the configuration of the (independent or parallel) inputs is carried out correctly.	Input OC
Input OV	E002	Input Overvoltage	This alarm is indicated when the inverter input voltage exceeds the operating threshold. The alarm is triggered before reaching the absolute threshold beyond which the inverter will be damaged. When the inverter input voltage exceeds the Over Voltage threshold, the inverter will not start because of the generation of the alarm.	Measure the input voltage in the inverter with a voltmeter. If it is higher than the maximum voltage of the operating interval, the alarm is real and you must check the configuration of the PV generator. If it is lower than the maximum voltage of the operating interval, the alarm is caused by an internal malfunctioning and you must contact Power-One Services.	Input OV
No Parameters	E003	Internal Parameters Error	The main microcontroller is unable to correctly initialize the two DSPs (booster	This is an error inside the inverter that cannot be checked externally. If the problem persists (after switching the inverter OFF and then	

			stage and inverter stage). This is usually due to communication problems on the internal bus of the inverter.	ON again), contact the Power-One Service Department.	
Start Timeout	E017	Inverter Module Start-Up Timeout	Error inside the inverter regarding the time for starting steady state operation of the DC-AC circuit part (Inverter).	Error inside the inverter that cannot be checked externally. If the problem persists (after switching the inverter OFF and then ON), contact the Power-One Service Department.	
Ground Fault	E018	Leakage Current Fail	The alarm is generated during normal operation of the inverter; a ground leakage current is detected in the DC section of the system. The alarm is accompanied by the lighting up of the red LED on the front of the inverter. The inverter may even also generate the E018 alarm message for the AC leakage currents associated with the capacitive nature of the photovoltaic generator compared to ground.	If possible, measure the insulation resistance using a megohmmeter positioned between the photovoltaic field (positive terminal short-circuited to the negative pole) and ground. If the measured value is less than 1 megaohm, the PV generator must be checked by a technician/installer to identify and eliminate the problem. If the measured value is greater than 1 megaohm and the error warning continues to be present, contact the Power-One Service Department.	
Self Test Error 3	E019	Leakage current sensor self-	Before connecting to the grid, the inverter	This is an error inside the inverter that cannot be checked externally. If	

		test fail	carries out an autotest that regards the leakage current sensor. The test is carried out by "forcing" a current of known value in the leakage current sensor: the microprocessor compares the read value with the known value. The error is generated if the comparison between the read value and the known value during the test is not within the allowed tolerance.	the problem persists (after switching the inverter OFF and then ON again), contact the Power-One Service Department. By its nature, the alarm appears only before connection to the grid.	
Self Test Error 1	E020	Booster relay self-test fail	Before connecting to the grid, the inverter carries out some internal tests. One of these tests regards the correct operation of the booster relay. The test is carried out by "forcing" the switching of the relay and checking its functionality. The error is generated if a problem is found with the operation of the relay.	This is an error inside the inverter that cannot be checked externally. If the problem persists (after switching the inverter OFF and then ON again), contact the Power-One Service Department. By its nature, the alarm appears only before connection to the grid.	
Self Test	E021	Inverter relay	Before	This is an error inside	

Error 2		self-test fail	connecting to the grid, the inverter carries out some internal tests. One of these tests regards the correct operation of the booster relay. The test is carried out by "forcing" the switching of the relay and checking its functionality. The error is generated if a problem is found with the operation of the relay.	the inverter that cannot be checked externally. If the problem persists (after switching the inverter OFF and then ON again), contact the Power-One Service Department. By its nature, the alarm appears only before connection to the grid.	
Self Test Error 4	E022	Relay self-test timeout	Time taken to execute the autotest carried out on the relays of the DC-AC circuit part (inverter) is too long. This may indicate a problem associated with the aforesaid relays.	Error inside the inverter that cannot be checked externally. If the problem persists (after switching the inverter OFF and then ON again), contact the Power-One Service Department.	
DC Inj error	E023	Do-Injection out of range	The error is generated if the direct component of the current supplied to the grid exceeds the threshold of 0.5% of the rated operating current. In any case, the inverter does not stop because of the	If the grid voltage is strongly distorted, report this anomaly to the grid company for the resolution of the problem. If there is an inverter fault, contact the Power-One Service Department.	

			E023 error, but tries to connect to the grid again. Sporadic repetition of the error is a sign of large grid distortions or sudden changes in irradiation, whereas systematic repetition of the error warning will be a sign of an inverter fault.		
Internal Error	E024	Internal Error	Error inside the inverter	Error inside the inverter cannot be checked externally. If the problem persists (after switching the inverter OFF and then ON again). Contact the Power-One Service Department.	
Riso Low	E025 (not shown on the display)	Low insulation resistance	Before connecting to the grid, the inverter measures the insulation resistance of the PV generator compared to ground. If the insulation resistance measured by the inverter is less than 1 Mohm, the inverter does not connect to the grid and shows the "Riso Low" error. The causes may be: -Damaged PV panel(s) Junction box(es) of the panels not properly sealed,	If possible, measure the insulation resistance using a megohmmeter positioned between the photovoltaic field (position terminal short-circuited to the negative pole) and ground (as described in the relevant section: "checking the ground insulation of the PV generator") If the measured value is less that 1 megaohm, the photovoltaic generator must be checked by a technician/installer to identify and eliminate the problem. If the measured value is greater than 1 megaohm and the error warning continues to be present, contact the Power-One	

			so allowing water and/or damp see page: -problems in the connections between panels (not perfectly connected): Poor quality cable junctions -Presence of unsuitable (trigger voltage lower than the characteristics of the PV generator strings) or damaged overvoltage surge arresters outside the inverter in the DC section. - Presence of damp inside the field panel, if there is one.	Service Department. (Damp increases leakage and can therefore be the cause of a reduction in insulation resistance.)	
Vref Error	E026	Bad Internal Reference voltage	Wrong measurement of the reference voltage inside the equipment.	Internal error that cannot be checked externally. If the problem persists (even after switching the inverter OFF and then ON again), contact the Power-One Service Department.	
Error Meas V	E027	VGrid Measures Fault	Error in the internal measurement of the grid voltage (imposed by regulations) to have a measurement redundancy (2 measurements on the same parameter carried out by	This is an error inside the inverter that cannot be checked externally. If the problem is persistent (even after switching the inverter OFF and then ON again). Contact the Power-One Service Department.	

			two different circuits).		
Error Meas F	E028	F Grid Measures Fault	Error in the internal measurement of the grid voltage (imposed by regulations) to have a measurement redundancy (2 measurements on the same parameter carried out by two different circuits).	This is an error inside the inverter that cannot be checked externally. If the problem is persistent (even after switching the inverter OFF and then ON again). Contact the Power-One Service Department.	
Error Meas Z	E029	Z Grid Measures Fault	Error in the internal measurement of the grid voltage (imposed by regulations) to have a measurement redundancy (2 measurements on the same parameter carried out by two different circuits).	This is an error inside the inverter that cannot be checked externally. If the problem is persistent (even after switching the inverter OFF and then ON again). Contact the Power-One Service Department.	
Error Meas lleak	E030	ILeak Measures Fault	Error in the internal measurement (carried out when the inverter is connected to the grid) of the leakage current of the DC side (PV generator compared to ground (imposed by regulations) to have a measurement redundancy (2	This is an error inside the inverter that cannot be checked externally. If the problem is persistent (even after switching the inverter OFF and then ON again). Contact the Power-One Service Department.	

			measurements on the same parameter carried out by two different circuits).		
Error Read V	E031	Wrong V measure	Measurement of the internal voltage at the ends of the output relay out of range. There is too great a difference in voltage between the input and the output of the output relay.	This is an error inside the inverter that cannot be checked externally. If the problem appears repeatedly, you must contact the Power-One Service Department.	
Error Read I	E032	Wrong I Measure	Measurement of the output voltage unbalance (carried out between the three phases) out of range (only in three-phase models.)	This is an error inside the inverter that cannot be checked externally. If the problem appears repeatedly, you must contact the Power-One Service Department.	
UTH	E033	Under Temperature	Temperature outside the inverter below -25 ^{0}C	Wait for the temperatures to which the inverter is exposed to return within operating range. If the problem persists, contact the Power-One Service. You must remember to wait for the time necessary to allow the inverter to warm up.	
Interlock fail	E034	IGBT not ready	Error inside the inverter	Error inside the inverter that cannot be checked externally. If the problem persists (after switching the inverter OFF and then ON again), contact the Power-One Service Department.	
Remote OFF	E035	Waiting	The inverter has	Switch ON the inverter	

	(not shown on the display)	remote ON	been switched OFF remotely (remote OFF) and remains in waiting state for the signal that will switch it ON again (remote ON).	remotely. If the unit does not switch ON, disable the remote ON/OFF function and switch the equipment OFF completely and then switch it ON again. If the problem persists (after re-enabling the remote ON/OFF function from the display), contact the Power-One Service Department.	
Vout Avg Error	E036	Average Vout out of range	The average grid voltage value (every 10 minutes) does not fall within the allowed ranges. The grid voltage at the point connected to the inverter is too high. This may be caused by a grid impedance that is too high. Towards the end of the timeout, the inverter limits the power to check whether the grid voltage stabilizes within the normal parameters. If this does not happen, the inverter disconnects from the grid.	Check the grid voltage at the inverter connection point. If the grid voltage diverges from the range because of grid conditions, ask the grid company to adjust the grid voltage. If the grid company authorizes a change to the inverter parameters, arrange the new limits with the Power-One Service Department.	
Riso Low	E037	Low insulation resistance (amorphous mode only)	This error can appear only if the “Amorphous” mode is enabled. This function is enabled only in inverters	Check for the presence and correct contacting of the two terminals of the grounding resistor installed inside the inverter. If possible, measure the insulation	

			equipped with grounding kit and is used to monitor the voltage at the ends of the grounding resistor. The error appears when the voltage at the ends of the resistor connected between ground and pole of the photovoltaic generator exceeds 30V for more than 30 minutes or 120V for more than one second.	resistance using a megohmmeter positioned between the PV field (positive terminal short- circuited to the negative pole) and ground (as described in the operation chapter) If the measured value is less than 1megaohm, the photovoltaic generator must be checked by a technician/installer to identify and eliminate the problem. If the measured value is greater than 1 megaohm and the error warning continues to be present, contact the Power-One Service Department/	
Mid Bulk OV	E038	Mid Bulk OV	Error inside the inverter	Error inside the inverter that cannot be checked externally. If the problem persists (after switching the inverter OFF and ON again), contact the Power-One Service Department.	
Sun Low	W001	(Low input voltage during switch-ON of the inverter)	Insufficient irradiation. Wrong configuration of the PV generator or a configuration “at the limit” as regards the minimum input voltage of the inverter.	Check the inverter input voltage. If it does not exceed the Vstart, check that there is sufficient irradiation and that the composition of the system is correct. If it exceeds the Vstart, contact the Power-One Service Department.	
Input UV	W002	(Low input voltage during switch-OFF)	Insufficient irradiation. Wrong configuration of the photovoltaic generator or a configuration “at	Check the inverter input voltage. If it does not exceed the Vstart, check that there is sufficient irradiation and that the composition of the system is correct. If it	

			the limit" as regards the minimum input voltage of the inverter.	exceeds the Vstart, contact the Power-One Service Department.	
Grid Fail	W003	Grid Fail (Grid voltage parameters outside the limits)	This error warning appears when, during normal operation of the inverter, the grid parameters fall outside the limits set by the grid company. No grid voltage (after the warning, the inverter goes on "No Vac"). Unstable grid voltage (downwards and upwards) Unstable grid frequency .	Check the grid voltage on the inverter. If absent, check for the absence of grid voltage on the supply. If the voltage on the supply. If the voltage tends to rise (when the inverter is connected), it means there are high line or grid impedance. Check the grid voltage on the supply as well; if it is high, it means there is a high-grid impedance. In this case, ask the grid companyto adjust the grid voltage. If the grid company authorizes a change to the inverter parameters, arrange the new limits with the Power-One Service. If the voltage at the supply point is much lower than that measured on the inverter, the line must be adjusted (inverter-counter). If the grid voltage and frequency fall within the limits (even when the inverter is connected to the grid), contact the Power-One Service Department.	
Table Fail	W009	Empty Wind Table		(Wind Models Only)	
Bulk UV	W011	Bulk Under-Voltage	Reading of the internal voltage on the bulk capacititors carried out when the interverter is	Check the inverter input voltage. If it does not exceed the Vstart, check that there is suffcient irradiation and that the composition	

			connected to the grid.	of the system is correct. If it exceeds the Vstart, contact the Power-One Service Department	
Jbox fail	W017	Fuse-control board fail (DC string fail)	Fuse(s) on the fuse boards is/are damaged.	Using a multimeter, check the condition of the fuses (situated on the fuse boards). Replace any open fuses and check that the input current on the string(s) does not exceed the rating of the fuses (if string parallels have been made outside the inverter). If there are no damaged string fuses and the inverter continues to display the alarm message, check whether the settings to be made through the Aurora Manager software are correct (presence or absence of one or more input strings).	
SPD DC Protection Open	W018	SPD DC protection open	Overvoltage surge arresters situated on the DC side are damaged.	Loot at the inspection window present on each surge arrester (DC side). If it is red, the surge arrester is damaged and the cartridge must be replaced if the alarm status continues to be present even though all the surge arresters have a green inspection window, contact the Power-One Service Department.	
SPD AC protection open	W019	SPD AC protection open	Overvoltage surge arresters situated on the AC side are damaged.	Look at the inspection window present on each surge arresterl (AC side). If it is red, the surge arrester is damaged and the cartirdge must be replaced. If the alarm status continues to be	

				present even though all the surge arresters have a green inspection window, contact the Power-One Service Department.	

Table 8: Error Codes

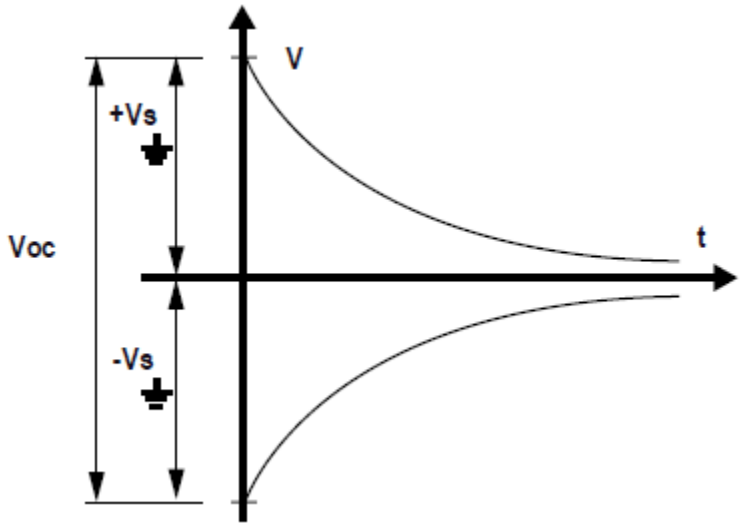
16.4 VERIFICATION OF GROUND LEAKAGE

If the inverter has reported a ground fault, there may be a ground leakage from the PV generator (DC side).
To check this, measure the voltage between the positive pole and ground and between the negative pole (of the PV generator) and ground using a voltmeter whose input accepts a voltage of at least 1000 Volts.

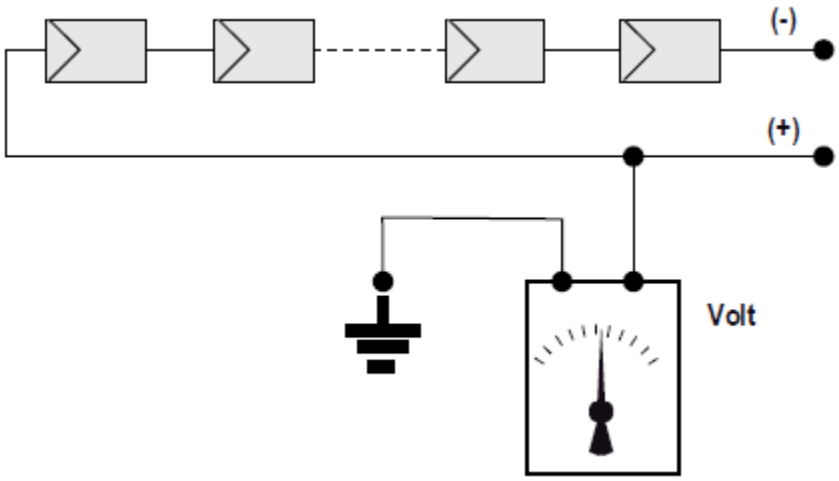
16.5 BEHAVIOR OF A SYSTEM WITHOUT LEAKAGE

Due to the capacitive effect of the PV generator, during the first moments that the voltmeter is connected between one of the two poles and ground, it will measure a voltage of about Voc/2, which will tend to stabilize to around 0V if there is no ground leakage, as shown in the graph below:

The internal resistance of the voltmeter tends to zero the voltage present on the PV generator due to the capacitive effect.

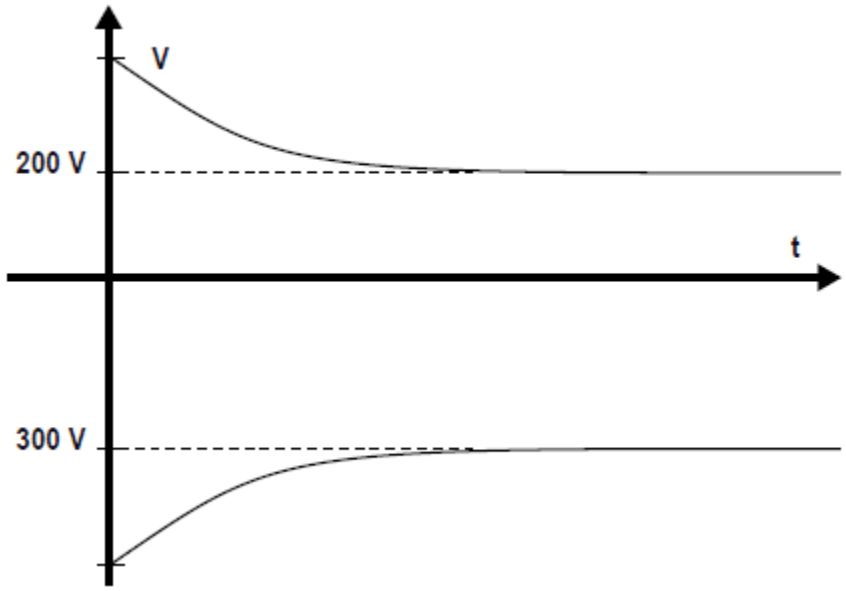


How to make the measurement:

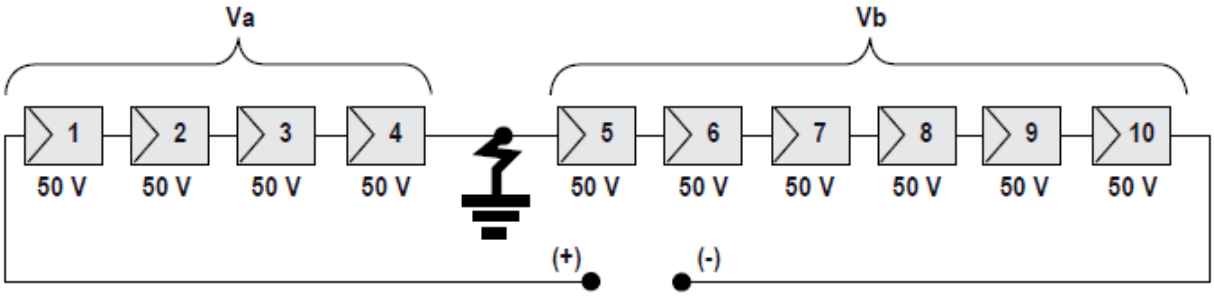


16.6 BEHAVIOR OF A SYSTEM WITH LEAKAGE

If the voltage measured between one of the two poles and ground does not tend to 0V and stabilizes on a value, there is a ground leakage from the photovoltaic generator.
Example: When the measurement is made between positive pole and ground, a voltage of 200V is measured.



This means that if the system is made up of 10 modules in series and each one supplies 50V, the leakage can be located between the 4th and 5th photovoltaic module.



Va = voltage measured between + pole and ⏚ = 200V
Vb = voltage measured between - pole and ⏚ = 300V
In all the measurements with ⏚, the ground of the inverter is indicated.

16.7 THE POWER ONE SERVICE CALL

Call **Power-One Technical Support at 1-877-261-1374** and provide the following information.

- ✓ AURORA model?
- ✓ Serial number?
- ✓ Week of production?
- ✓ Which LED is flashing?
- ✓ Steady or flashing light?
- ✓ What signals are shown on the display?

NOTE: information above is available from the LCD display

Additional helpful information when troubleshooting with the Power-One Technical Service Engineers:

- Provide a brief description of the fault.
- Information on the photovoltaic field
- Brand and model of photovoltaic panels
- Identify the system structure:
- Maximum array voltage and current values
- Number of strings in the array
- Number of panels for each string
- Can the fault be reproduced? If so, how?
- Is the fault cyclical in nature? If so, how often?
- Was the fault apparent at the time of installation?
- If so, has it got worse?
- Describe the atmospheric conditions at the time the fault appears/appeared.

PART 6: MAINTENANCE GUIDE

17 MAINTENANCE

17.1 GENERAL CONDITIONS

Checking and maintenance operations must be carried out by specialized staff assigned to carry out this work. DO NOT allow the equipment to be used if problems of any kind are found, and restore the normal conditions correctly or in case make sure this is done.

Maintenance operations must be carried out with the equipment disconnected from the grid, unless otherwise indicated.

For cleaning, DO NOT use rags made of filamentary material or corrosive products that may corrode parts of the equipment or generate electrostatic charges.
Avoid temporary repairs. All repairs should be carried out using only manufacturer-approved spare parts.

The maintenance technician is under an obligation to promptly report any anomalies.

Always use the personal protective equipment provided by the employer and comply with the safety conditions of the Accident prevention chapter.

Always use the personal protective equipment provided by the employer and comply with the safety conditions of the accident prevention chapter.

Power-One accepts no liability if the checking and maintenance cycles indicated in this manual and in the attached documentation are not complied with correctly, and also when maintenance is entrusted to unqualified staff.

17.2 ROUTINE MAINTENANCE

Routine maintenance operations can be carried out directly by the installer.

200 h		Perform monthly cleaning of the equipment; verify, in particular, the cleaning of the heat sink **08**, in order to avoid obstructions that could compromise the air flow. Use compressed air, a vacuum cleaner or special cleaners, if possible.
1,000 h		Clean the photovoltaic panels **every six months**, at the change of season or as necessary. The performance of the system depends very much on the condition of the PV panels. To clean, follow the specifications of the PV panel supplier.
1,000 h		**Every six months** or in the event of malfunctioning, check that the environmental conditions have not changed drastically (exposure to weather conditions); also check that the inverter or PV panels have not been shaded or isolated by foreign bodies.
2,000 h		Once a year or in the event of malfunctioning, check the tightness of EMT Fitting, the fixing of the connectors, of the inverter front cover **04** and of the wiring box front cover **06**. Any infiltration can generate problems of humidity and consequent short circuit.

17.3 SPECIAL MAINTENANCE

Special maintenance operations can be carried out only by the installer or qualified staff.

Table 2: Special Maintenance

1,000 h		Carry out tests every six months or in the case of anomalies, particularly after violent weather events, input varistors a01 and output varistors a06 installed on the main board **11**. Before restarting the inverter the cause of the failure must be resolved.
1,000 h		Carry out tests every six months or in the case of malfunction, the fastening of all the connections, in particular the EMT Fitting, the terminal block and the screws of the inverter front cover **04** and of the wiring box front cover **06**.
1,000 h		**Every six months** or in the event of malfunctioning, check the inverter cooling fans. Before connecting to the grid, the inverter carries out a test on the internal fans and, in the event of an anomaly, generates an alarm signal.
2,000 h		Once a year or in the event of malfunctioning, check the backup battery and replace it if necessary. The battery normally lasts 10 years, but many conditions can reduce efficiency. The battery is found in the slot a20 of the main board **11**.

Table 10: Routine Maintenance

17.4 MEASURING THE INSULATION RESISTANCE (RISO)

RISO is affected by environmental conditions, e.g., PV modules wet or damp; therefore, the measurement must be made immediately after the fault is detected.

To measure the insulation resistance of the PV generator compared to ground (⏚), the two poles of the PV generator must be shorted (using a suitably sized switch).

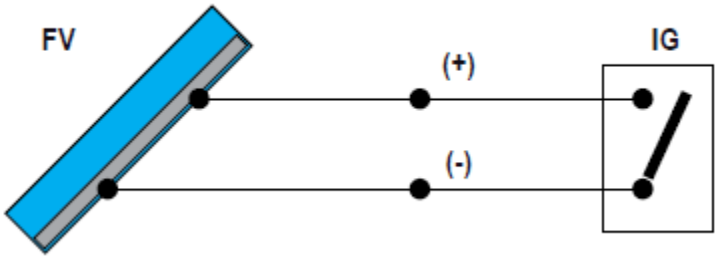


Figure: 6.0a Measuring the insulation resistance

Once the short-circuit has been made, measure the insulation resistance (RISO) using a meg-ohmmeter positioned between the two shorted poles and ground (of the inverter).
Figure 6.0a

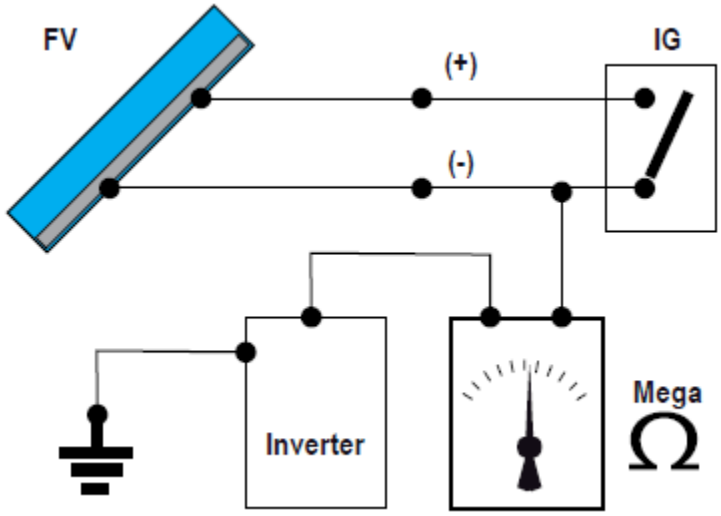


Figure 6.0b: RISO not connecting to the grid

If the RISO is less than 1 MOhm, the inverter does not connect to the grid because of low insulation of the photovoltaic generator to ground. Figure 6.0b

The RISO is affected by the environmental conditions the PV generator is in (E.g.: PV modules wet from damp or rain), and therefore the measurement must be made immediately after the inverter gives the RISO LOW warning.

17.5 STORAGE AND DISMANTLING

17.6 STORAGE OF THE EQUIPMENT OR PROLONGED STOP

If the equipment is not used immediately or is stored for long periods, check that it is correctly packed and contact ***Power-One*** for storage instructions.

The equipment must be stored in well-ventilated indoor areas that do not have characteristics that might damage the components of the equipment.
Restarting after a long or prolonged stop requires a check and, in some cases, the removal of oxidation and dust that will also have settled inside the equipment if not suitable protected.

17.7 DISMANTLING, DECOMMISSIONING AND DISPOSAL

Power-One CANNOT be held responsible for disposal of the equipment: displays, cables, batteries, accumulators, etc., and therefore the customer must dispose of these substances, which are potentially harmful to the environment, in accordance with the regulations in force in the country of installation.
If the equipment is dismantled, to dispose of the products it consists of, users must stick to the regulations in force in the country of destination and in any case avoid causing any kind of pollution.

Dispose of the various types of materials that the parts of the equipment consist of in dumps that are suitable for the purpose.

Table 11: Disposal of Components

COMPONENT	MATERIAL OF CONSTRUCTION
Frame, brackets, supports	Arc-welded steel FE37
Casing or covers	ABS, plastic
Paint	RAL
Gaskets and seals	Rubber / Teflon / Viton
Electrical cables	Copper / Rubber
Cable trays	Polyethylene / Nylon
Backup battery	Nickel / Lead/ Lithium

17.8 SHUT DOWN PROCEDURE

There are three options for shutting down the inverter:

a) Disconnect the DC and the AC grid, by disconnecting its associated switches (in any order). The inverter will shut down within a few seconds necessary to discharge the internal capacitors.
b) Disconnect the DC input by turning-OFF the associated disconnect switch and waiting for the UV port time out.
c) Disconnect the grid, by turning-OFF its associated disconnect switch and reduce DC input to less than 130 Vdc.

17.9 POWER-DOWN PROCEDURES

Once the inverter is wired and connected to the grid use the following procedures to disconnect for maintenance.

WARNING

Before performing any operation on the switchbox power input, ALWAYS perform the appropriate disconnection procedure outlined below.

17.10 CR2032 LITHIUM BATTERY REPLACEMENT

WARNING

- Before performing any operation on the switchbox power input or on the inverter, ALWAYS perform the disconnection procedure as explained in Part 4: Operations of this manual.
- The replacement of this battery should be performed only by trained personnel.

Inside the AURORA Inverter there is a CR2032 lithium battery. When this battery is at end-of-life, a message will be shown in the display informing that the battery needs to be replaced.

The battery is visible after removing the AURORA PV Inverter's front panel. Refer Figure 3.2 above for the procedure to remove the front panel.

To insert the new battery into its holder, slide the battery at a 30° angle pushing it into insertion as shown in Figure 6.0a below. When pushed on into insertion it should seat into the correct position within the holder.

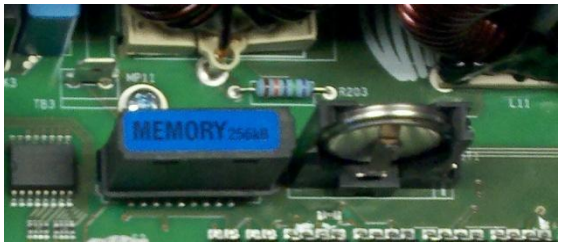


Figure 6.1: Location of lithium battery

After battery replacement is completed, re-install and secure the front panel of the inverter and perform the start-up procedure in Part 4: Operations.

PART 7: APPENDIX

18 TECHNICAL DATA

18.1 DATA SHEETS

TECHNICAL DATA	VALUES	UNO-2.0-I-OUTD-US			UNO-2.5-I-OUTD-US		
Nominal Output Power	W	2000			2500		
Rated Grid AC Voltage	V	208	240	277	208	240	277
Input Side (DC)							
Number of Independent MPPT Channels		1			1		
Maximum Usable Power for Each Channel	W	2300			2900		
Absolute Maximum Voltage	V	520			520		
Start- Up Voltage (Vstart)	V	200 (adj. 120-350)			200 (adj. 120-350)		
Full Power MPPT Voltage Range	V	170-470			205-470		
Operating MPPT Voltage Range	V	0.7xVstart-520			0.7xVstart-520		
Maximum Usable Current	A	12.5			12.8		
Number of Wire Landing Terminals Per Channel		2 Pairs			2 Pairs		
Array Wiring Termination		Terminal block, Pressure Clamp, 20AWG-6AWG			Terminal block, Pressure Clamp, 20AWG-6AWG		
Output Side (AC)							
Grid Connection Type		1Ø/2W	Split-Ø/3W	1Ø/2W	1Ø/2W	Split-Ø/3W	1Ø/2W
Adjustable Voltage Range (Vmin-Vmax)	V	183-228	211-264	244-304	183-228	211-264	244-304
Grid Frequency	Hz	60			60		
Adjustable Grid Frequency Range	Hz	57-60.5			57-60.5		
Maximum Current	A	10			12		
Power Factor		> 0.990			> 0.990		
Total Harmonic Distortion At Rated Power	%	< 2			< 2		
Grid Wiring Termination Type		Terminal Block, Pressure Clamp, 20AWG-6AWG			Terminal Block, Pressure Clamp, 20AWG-6AWG		
Protection Devices							
Input							
Reverse Polarity Protection		Yes			Yes		
Over-Voltage Protection Type		Varistor, 2			Varistor, 2		
PV Array Ground Fault Detection		Meets UL1741/NEC 690.5 requirements			Meets UL1741/NEC 690.5 requirements		
PV Array Isolation Control		GFDI (for use with either Positive or Negative Grounded Arrays)			GFDI (for use with either Positive or Negative Grounded Arrays)		
Output							
Anti-Islanding Protection		Meets UL 1741/IEE1547 requirements			Meets UL 1741/IEE1547 requirements		
Over-Voltage Protection Type		Varistor, 2 (L_1 - L_2 / L_1 - G)			Varistor, 2 (L_1 - L_2 / L_1 - G)		
Efficiency							
Maximum Efficiency	%	96.3			96.3		
CEC Efficiency	%	95.5	95.5	95.5	95.5	96	96
Operating Performance							
Stand-by Consumption	W_{RMS}	< 8			< 8		
Night Time Consumption	W_{RMS}	< 0.6W			< 0.6W		
Communication							
User-Interface		5.5" x 1.25" Graphic Display			5.5" x 1.25" Graphic Display		
Remote Monitoring		AURORA-UNIVERSAL (opt.)			AURORA-UNIVERSAL (opt.)		
Wired Local Monitoring		PVI-USB-RS485_232 (opt.), PVI-DESKTOP (opt.)			PVI-USB-RS485_232 (opt.), PVI-DESKTOP (opt.)		
Wireless Local Monitoring		PVI-DESKTOP (opt.) with PVI-RADIOMODULE (opt.)			PVI-DESKTOP (opt.) with PVI-RADIOMODULE (opt.)		
Environmental							
Ambient Air Operating Temperature Range	°C/°F	-25 to +60 / -13 to +140			-25 to +60 / -13 to +140		
Ambient Air Storage Temperature Range	°C/°F	-40 to +80 / -40 to +176			-40 to +80 / -40 to +176		
Relative Humidity	%	0-100 condensing			0-100 condensing		
Acoustic Noise Emission Level	db (A) @1m	< 50			< 50		
Maximum Altitude for Full Power Operation	ft(m)	6560 (2000)			6560 (2000)		
Mechanical Specifications							
Enclosure rating		NEMA 4X			NEMA 4X		
Cooling		Natural Convection			Natural Convection		
Dimensions (H x W x D)	in/(mm)	30.3 x 14.4 x 6.3 / 769 x 367 x 161 with switch			30.3 x 14.4 x 6.3 / 769 x 367 x 161 with switch		
Weight	lb/(kg)	42.5/19.3 with switch			42.5/19.3 with switch		
Mounting System		Wall bracket			Wall bracket		
Conduit Connections**		Bottom: (2) 3/4" EKO , (3) 1/2" EKO / Left and Right Side: (1) 3/4" EKO / Back: (4) 3/4" EKO			Bottom: (2) 3/4" EKO , (3) 1/2" EKO / Left and Right Side: (1) 3/4" EKO / Back: (4) 3/4" EKO		
DC Switch Rating		16 A / 600 VDC			16 A / 600 VDC		
Safety							
Isolation Level		High-Frequency Transformer			High-Frequency Transformer		
Safety and EMC Standard		UL1741(2010), IEE1547, CSA C22.2 N. 107.1-01, FCC Part 15 Class B			UL1741(2010), IEE1547, CSA C22.2 N. 107.1-01, FCC Part 15 Class B		
Safety Approval		$_cCSA_{us}$			$_cCSA_{us}$		
Warranty							
Standard Warranty	years	10			10		
Extended Warranty	years	15 & 20			15 & 20		
Available Models							
Standard		UNO-2.0-I-OUTD-US			UNO-2.5-I-OUTD-US		
With DC Switch and Wiring Box		UNO-2.0-I-OUTD-S-US			UNO-2.5-I-OUTD-S-US		

*All data is subject to change without notice

** When equipped with optional DC Switch and Wiring Box

AURORA UNO 3

Figure 7.0: UNO-2.0/2.5-I-OUTD-US Datasheet

PART A: UTILITY INTERACTIVE INVERTER, MODELS UNO-2.5-I-OUTD-US, UNO-2.5-I-OUTD-S-US

Model	UNO-2.5-I-OUTD-US	UNO-2.5-I-OUTD-S-US
Maximum Input Voltage (DC)	520 V dc	520 V dc
Range of Input Operating Voltage (DC)	90-520 V dc, 340 V dc nominal	90-520 V dc, 340 V dc nominal
Maximum Input Current (DC)	12.8 A	12.8 A
Maximum Input Short Circuit Current (DC)	15A	15A
Maximum Utility Backfeed Current (AC)	0 A	0 A
Output Power Factor Rating	>0.995	>0.995
Operating Voltage Range (AC) (See Note 2)	244-304 V ac for 277 V ac configuration 211-264 V ac for 240 V ac configuration 183-228 V ac for 208 V ac configuration	244-304 V ac for 277 V ac configuration 211-264 V ac for 240 V ac configuration 183-228 V ac for 208 V ac configuration
Operating Frequency Range (HZ)	59.3-60.5 Hz (Default) 57.0-59.7 Hz, 60.5-63.0 Hz (Field Adjustable)	59.3-60.5 Hz (Default) 57.0-59.7 Hz, 60.5-63.0 Hz (Field Adjustable)
Number of Phases	1	1
Nominal Output Voltage (AC) (See Note 2)	277 V ac / 240 V ac / 208 V ac	277 V ac / 240 V ac / 208 V ac
Normal Output Frequency	60 Hz	60 Hz
Continuous Output Current (AC)	10.5 A / 12 A / 12 A	10.5 A / 12 A / 12 A
Maximum Output Power (AC) (See Note 4)	2750 W/ 2750 W / 2750 W	2750 W/ 2750 W / 2750 W
Maximum Continuous Output Power (AC) @ +45°C ambient (See Note 4)	2500 W	2500 W
Maximum Output Fault Current and Duration	(See Note 5)	(See Note 5)
Maximum Output Overcurrent Protection	15 A / 15 A/ 15 A	15 A / 15 A/ 15 A
Utility Interconnection and Voltage and Frequency Trip Limits and Trip Times	See Note 6	See Note 6
Synchronization in-rush current	Negligible	Negligible
Trip Limit and Trip Time Accuracy	Voltage: +/- 2% Frequency: +/- 0.10 Hz Time: 2 grid cycles (33 ms @ 60 Hz)	Voltage: +/- 2% Frequency: +/- 0.10 Hz Time: 2 grid cycles (33 ms @ 60 Hz)
Normal Operation Temperature Range	-25°C to +60°C (See Note 4)	-25°C to +60°C (See Note 4)
Output Power Temperature Derating and Maximum Full Power Operating Ambient	(See Note 4)	(See Note 4)
Enclosure Rating Type	4X	4X

Notes:

1. Inverter models UNO-2.5-I-OUTD-US, UNO-2.5-I-OUTD-S-US have been evaluated for use in utility-interactive applications.

2. The output of Inverter, models UNO-2.5-I-OUTD-US, UNO-2.5-I-OUTD-S-US may be 277 V ac, 240 V ac or 208 V ac which is user settable based on the utility system.

4. Maximum continuous output power can be delivered only with an input voltage range of:

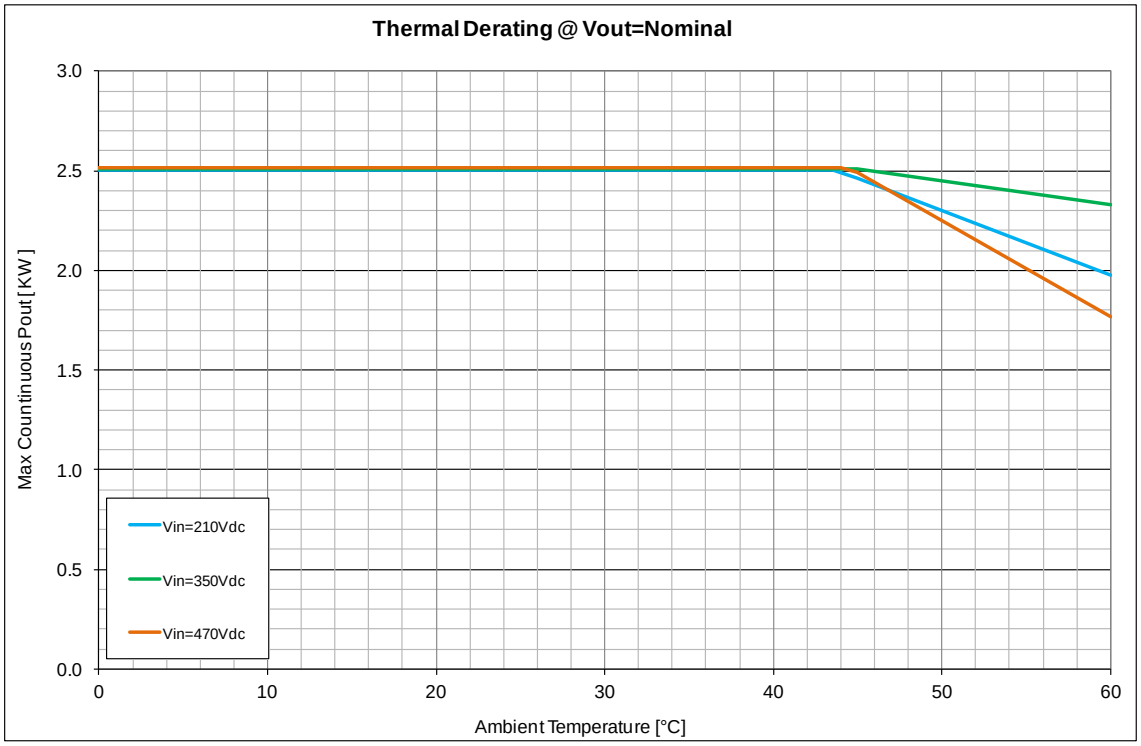
200-470 V dc for 208 V ac configuration
200-470 V dc for 240 V ac configuration
200-470 V dc for 277 V ac configuration

Maximum output power can be delivered only with an input voltage range of:

220-470 V dc for 208 V ac configuration
220-470 V dc for 240 V ac configuration
220-470 V dc for 277 V ac configuration

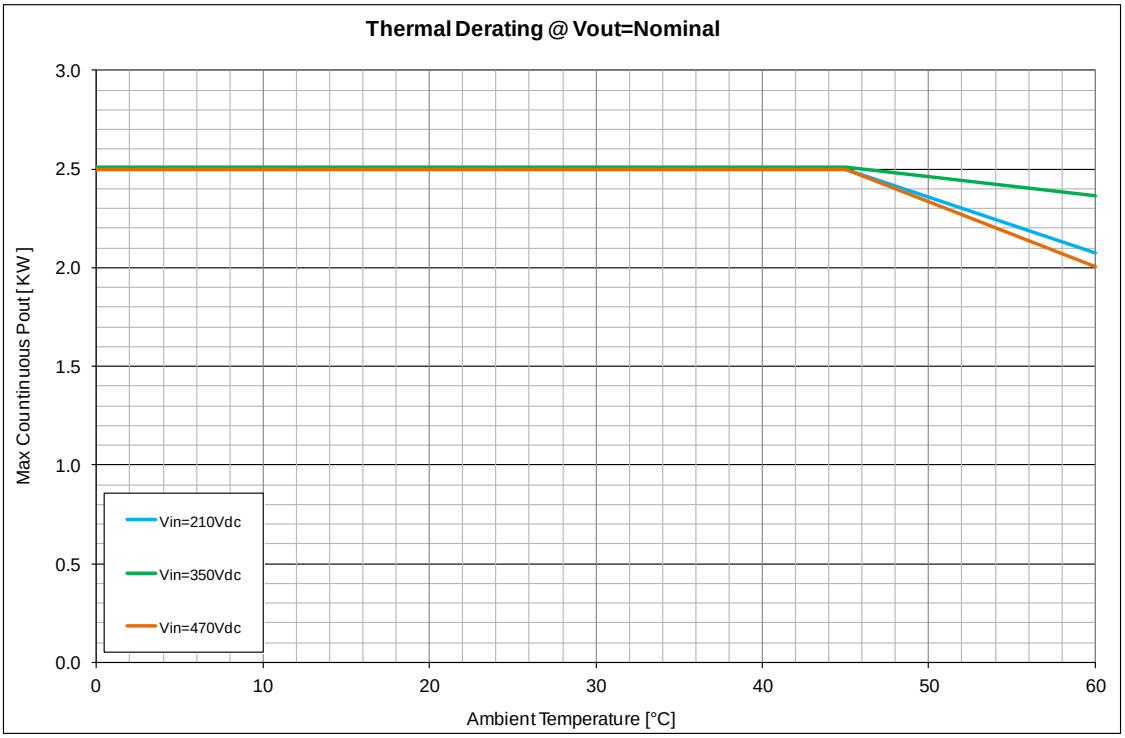
Model: UNO-2.5-I-OUTD-US @ 208Vac

Output Power Derating vs Ambient Temperature



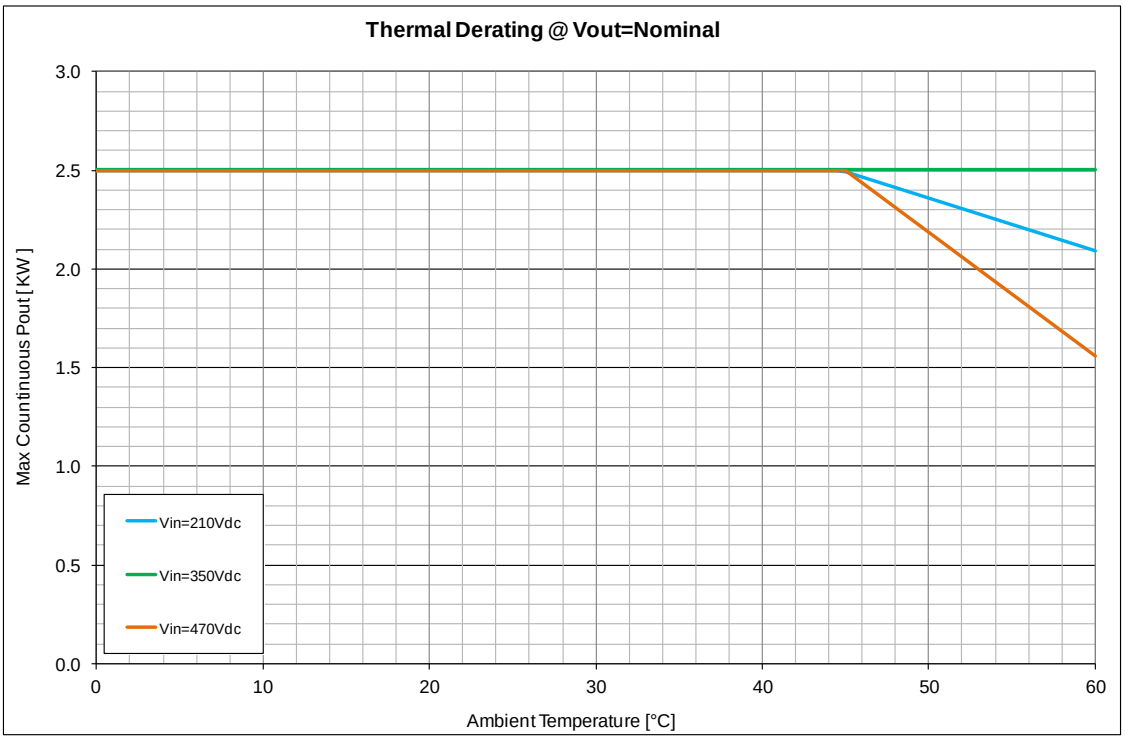
Model: UNO-2.5-I-OUTD-US @ 240Vac

Output Power Derating vs Ambient Temperature



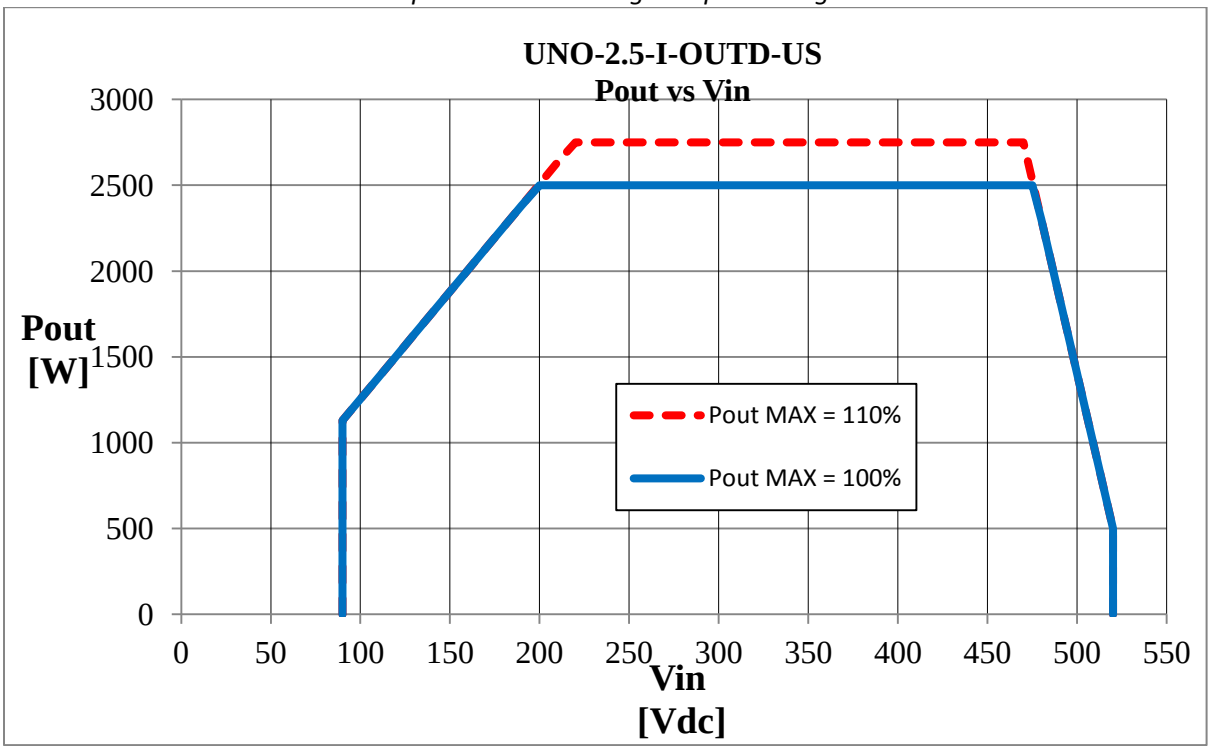
Model: UNO-2.5-I-OUTD-US @ 277Vac

Output Power Derating vs Ambient Temperature



Model: UNO-2.5-I-OUTD-US

Output Power Derating vs Input Voltage



5. Maximum Output Fault Current and Duration:

Models	Output Voltage	Fault Current PK (A)	Fault Current RMS (A) 1 cycle	Fault Current RMS (A) 3 cycles	Fault Current RMS (A) / Total Duration (mSec)
UNO-2.5-I-OUTD series & UNO-2.5-I-OUTD-US	208	68.93	11.7	7.78	5.84 / 89.1ms
UNO-2.5-I-OUTD series & UNO-2.5-I-OUTD-US	240	20.27	8.33	4.84	7.63 / 20.0ms
UNO-2.5-I-OUTD series & UNO-2.5-I-OUTD-US	277	89.34	10.85	7.21	7.21 / 50.0ms

NOTE 6: UTILITY INTERCONNECTION AND VOLTAGE AND FREQUENCY TRIP LIMITS AND TRIP TIMES: VOLTAGE AND FREQUENCY LIMITS FOR UTILITY INTERACTION

Condition	Simulated utility source		Maximum time (sec) at 60 Hz[a] before cessation of current to the simulated utility
	Voltage (V)	Frequency (Hz)	
A	< 0.50 V_{nor}	Rated	0.16

B	0.50 V_{nor} ≤ V < 0.88 V_{nor} (Adjustable Set Points 55% to 88%)	Rated	2 (Default) (Adj. Set Points 0.16 to 5s)
C	1.10 V_{nor} < V < 1.20 V_{nor} (Adj. Set Points 110% to 115%)	Rated	1 (Default) (Adj. Set Points 0.16 to 5s)
D	1.20 V_{nor} ≤ V	Rated	0.16
E	Rated	f > 60.5 (Adj. Set Points 60.5 to 63.0)	0.16 (Default (Adj. Set Points 0.16 to 300s)
F	Rated	f < 59.3 (Default) (Adj. Set Points 59.7 to 57)	0.16 (Default (Adj. Set Points 0.16 to 300s)
G	Rated	f < 57.0	0.16

[a] When a utility frequency other than 60 Hz is used for the test, the maximum number of cycles it takes to cease to export power to the simulated utility shall not exceed the number of cycles a utility frequency of 60 Hz takes regardless of the time the inverter takes to cease to export power to the simulated utility.

[b] V is the nominal output voltage rating.

[C] The rate of change in frequency shall be less than 0.5 Hz per second.

18.2 PART B:

UTILITY INTERACTIVE INVERTER, MODELS UNO-2.0-I-OUTD-US, UNO-2.0-I-OUTD-S-US :

Model	UNO-2.0-I-OUTD-US	UNO-2.0-I-OUTD-S-US
Maximum Input Voltage (DC)	520 V dc	520 V dc
Range of Input Operating Voltage (DC)	90-520 V dc, 340 V dc nominal	90-520 V dc, 340 V dc nominal
Maximum Input Current (DC)	12.5 A	12.5 A
Maximum Input Short Circuit Current (DC)	15 A	15 A
Maximum Utility Backfeed Current (AC)	0 A	0 A
Output Power Factor Rating	>0.995	>0.995
Operating Voltage Range (AC) (See Note 2)	244-304 V ac for 277 V ac configuration 211-264 V ac for 240 V ac configuration 183-228 V ac for 208 V ac configuration	244-304 V ac for 277 V ac configuration 211-264 V ac for 240 V ac configuration 183-228 V ac for 208 V ac configuration
Operating Frequency Range (HZ)	59.3-60.5 Hz (Default) 57.0-59.7 Hz, 60.5-63.0 Hz (Field Adjustable)	59.3-60.5 Hz (Default) 57.0-59.7 Hz, 60.5-63.0 Hz (Field Adjustable)
Number of Phases	1	1
Nominal Output Voltage (AC) (See Note 2)	277 V ac / 240 V ac / 208 V ac	277 V ac / 240 V ac / 208 V ac
Normal Output Frequency	60 Hz	60 Hz

Continuous Output Current (AC)	9 A / 10 A / 10 A	9 A / 10 A / 10 A
Maximum Output Power (AC) (See Note 4)	2200 W/ 2200 W / 2200 W	2200 W/ 2200 W / 2200 W
Maximum Continuous Output Power (AC) @ +50°C ambient (See Note 4)	2000 W / 2000 W / 2000 W	2000W / 2000 W / 2000 W
Maximum Output Fault Current and Duration	(See Note 5)	(See Note 5)
Maximum Output Overcurrent Protection	15 A / 15 A/ 15 A	15 A / 15 A/ 15 A
Utility Interconnection and Voltage and Frequency Trip Limits and Trip Times	See Note 6	See Note 6
Synchronization in-rush current	Negligible	Negligible
Trip Limit and Trip Time Accuracy	Voltage: +/- 2% Frequency: +/- 0.10 Hz Time: 2 grid cycles (33 ms @ 60 Hz)	Voltage: +/- 2% Frequency: +/- 0.10 Hz Time: 2 grid cycles (33 ms @ 60 Hz)
Normal Operation Temperature Range	-25°C to +60°C (See Note 4)	-25°C to +60°C (See Note 4)
Output Power Temperature Derating and Maximum Full Power Operating Ambient	(See Note 4)	(See Note 4)
Enclosure Rating Type	4X	4X

Notes:

1. Inverter models UNO-2.0-I-OUTD-US, UNO-2.0-I-OUTD-S-US have been evaluated for use in utility-interactive applications.

2. The output of Inverter, models UNO-2.0-I-OUTD-US, UNO-2.0-I-OUTD-S-US may be 277 V ac, 240 V ac or 208 V ac which is user settable based on the utility system.

4. Maximum continuous output power can be delivered only with an input voltage range of:

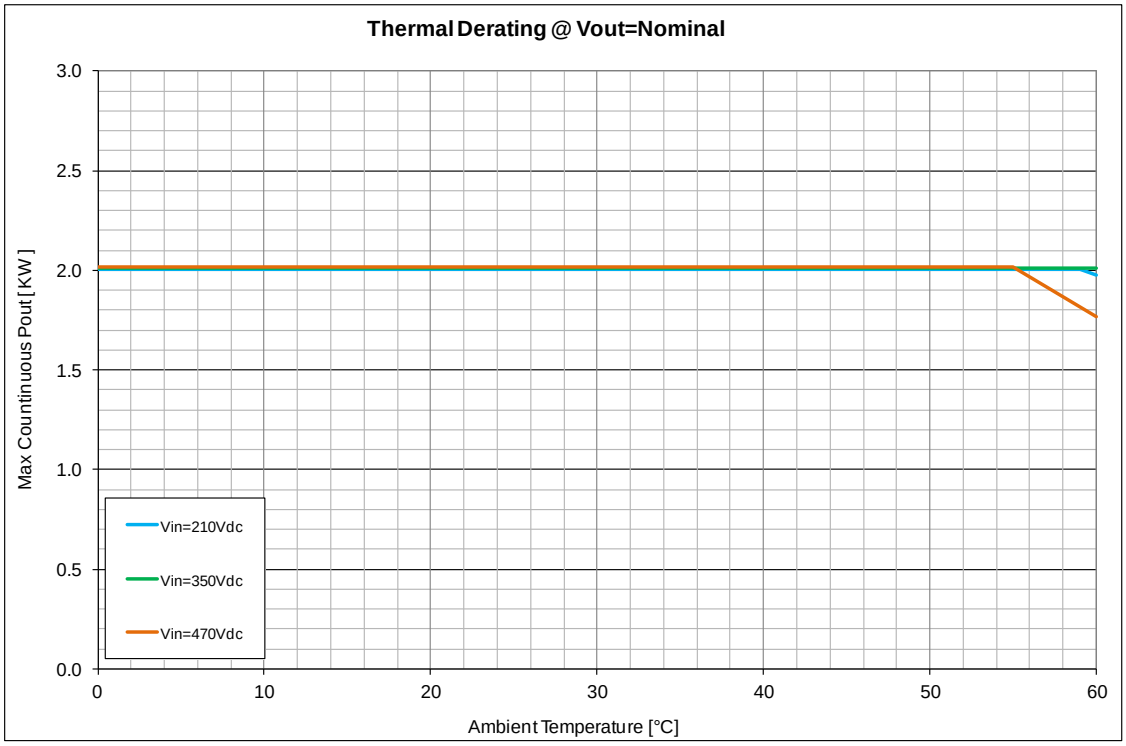
   170-470 V dc for 208 V ac configuration
   170-470 V dc for 240 V ac configuration
   170-470 V dc for 277 V ac configuration

   Maximum output power can be delivered only with an input voltage range of:

   185-470 V dc for 208 V ac configuration
   185-470 V dc for 240 V ac configuration
   185-470 V dc for 277 V ac configuration

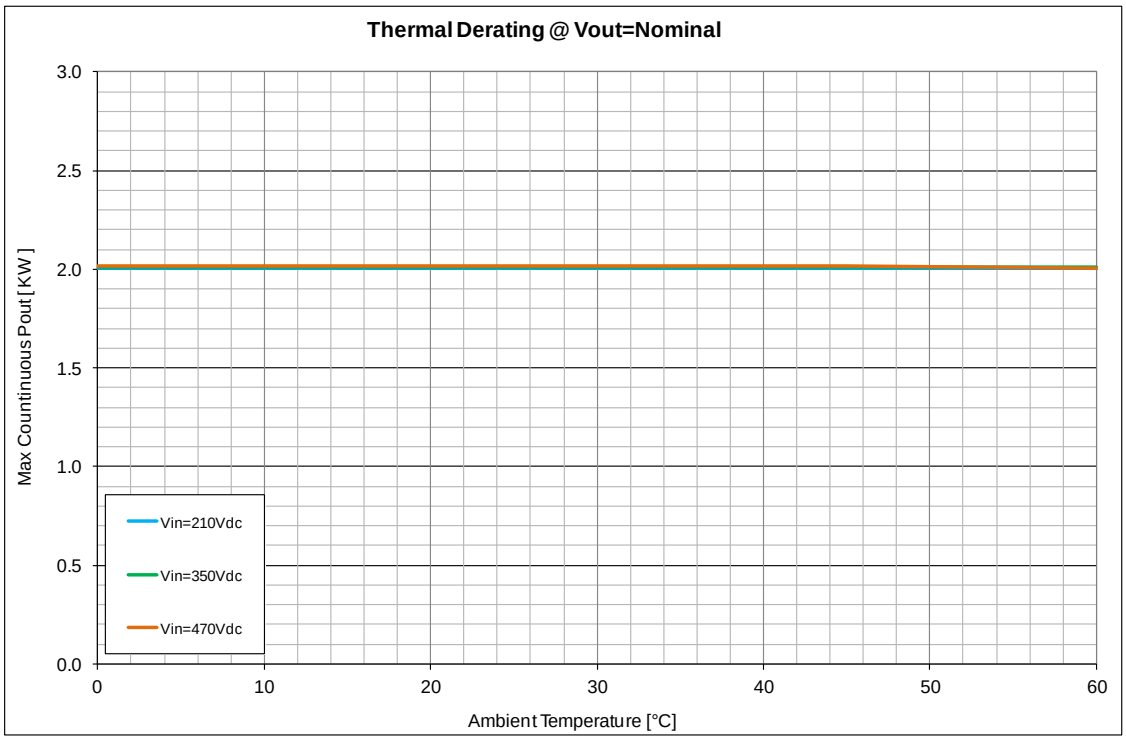
Model: UNO-2.0-I-OUTD-US @ 208Vac

Output Power Derating vs Ambient Temperature



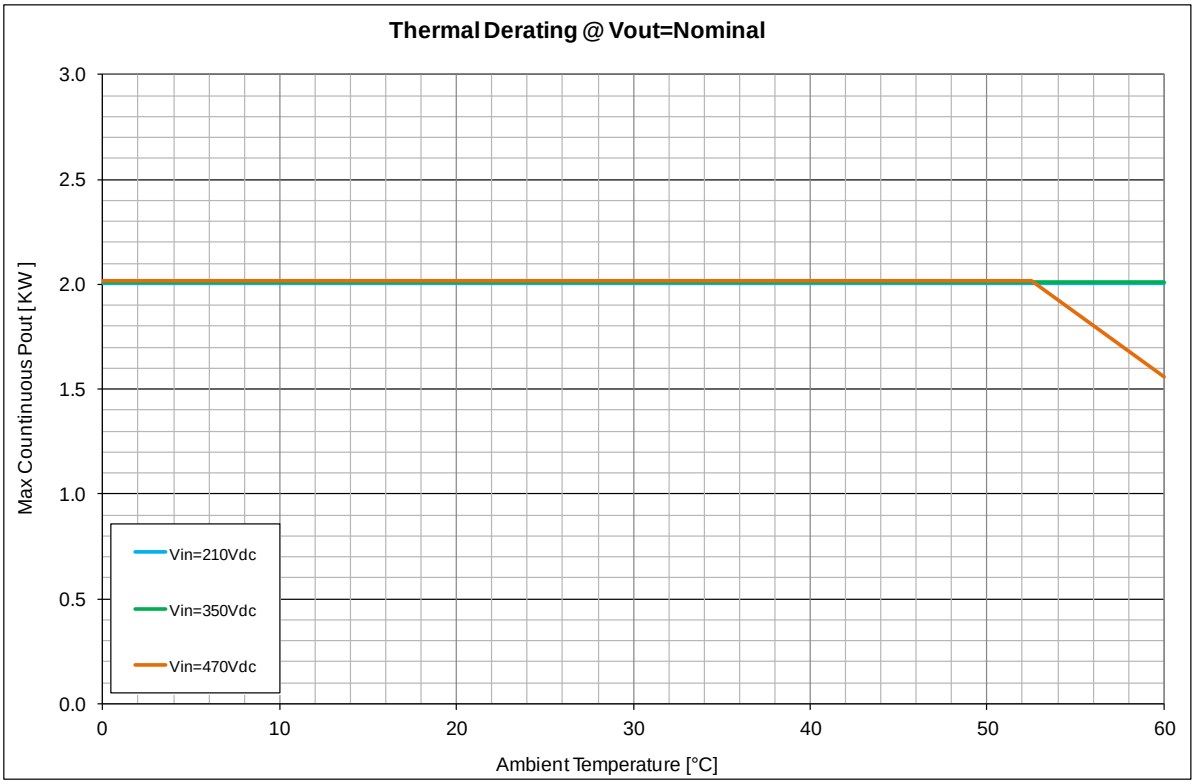
Model: UNO-2.0-I-OUTD-US @ 240Vac

Output Power Derating vs Ambient Temperature



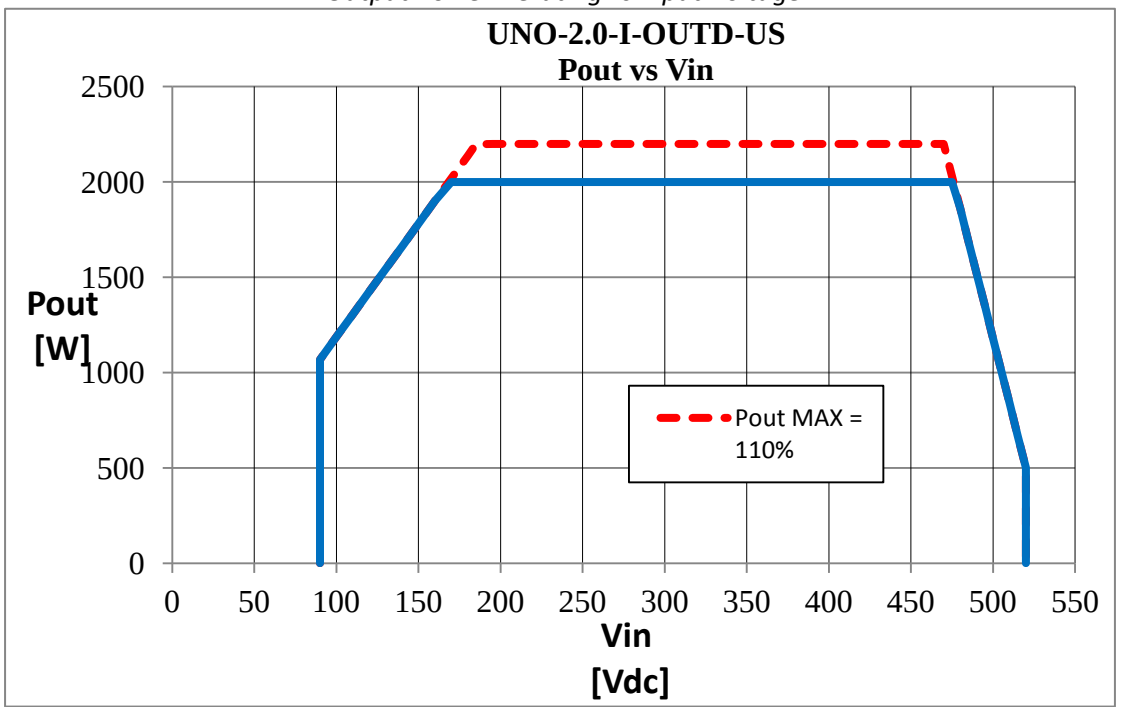
Model: UNO-2.0-I-OUTD-US @ 277Vac

Output Power Derating vs Ambient Temperature



Model: UNO-2.0-I-OUTD-US

Output Power Derating vs Input Voltage



5. Maximum Output Fault Current and Duration:

Models	Output Voltage	Fault Current PK (A)	Fault Current RMS (A) 1 cycle	Fault Current RMS (A) 3 cycles	Fault Current RMS (A) / Total Duration (mSec)
UNO-2.0-I-OUTD-US & UNO-2.0-I-OUTD-S-US	208	68.93	11.7	7.78	5.84 / 89.1ms
UNO-2.0-I-OUTD-US & UNO-2.0-I-OUTD-S-US	240	20.27	8.33	4.84	7.63 / 20.0ms
UNO-2.0-I-OUTD-US & UNO-2.0-I-OUTD-S-US	277	89.34	10.85	7.21	50.0ms

6. UTILITY INTERCONNECTION AND VOLTAGE AND FREQUENCY TRIP LIMITS AND TRIP TIMES: VOLTAGE AND FREQUENCY LIMITS FOR UTILITY INTERACTION

Condition	Simulated utility source		Maximum time (sec) at 60 Hz[a] before cessation of current to the simulated utility
	Voltage (V)	Frequency (Hz)	
A	< 0.50 V_{nor}	Rated	0.16
B	0.50 V_{nor} ≤ V < 0.88 V_{nor} (Adjustable Set Points 55% to 88%)	Rated	2 (Default) (Adj. Set Points 0.16 to 5s)
C	1.10 V_{nor} < V < 1.20 V_{nor} (Adj. Set Points 110% to 115%)	Rated	1 (Default) (Adj. Set Points 0.16 to 5s)
D	1.20 V_{nor} ≤ V	Rated	0.16
E	Rated	f > 60.5 (Adj. Set Points 60.5 to 63.0)	0.16 (Default (Adj. Set Points 0.16 to 300s)
F	Rated	f < 59.3 (Default) (Adj. Set Points 59.7 to 57)	0.16 (Default (Adj. Set Points 0.16 to 300s)
G	Rated	f < 57.0	0.16

[a] When a utility frequency other than 60 Hz is used for the test, the maximum number of cycles it takes to cease to export power to the simulated utility shall not exceed the number of cycles a utility frequency of 60 Hz takes regardless of the time the inverter takes to cease to export power to the simulated utility.

[b] V is the nominal output voltage rating.

[C] The rate of change in frequency shall be less than 0.5 Hz per second.

18.3 TIGHTENING TORQUES

To maintain the NEMA 4X protection of the system and for optimal installation, the following tightening torques must be used:

Inverter front cover **04** screws	**19.47in/lbs**
Wiring box front cover **06** screws	**19.47in/lbs**
AC output screw terminal block **22**	**13.28 in/lbs**
DC input screw terminal block **23**	**13.28 in/lbs**
Signals screw terminal block	**2.23in/lbs**

Table 12 Torque values

18.4 TOPOGRAPHIC DIAGRAM OF THE EQUIPMENT

The diagram summarizes the operation of the inverter. The main blocks are the DC-DC input converter (called "booster") and the DC-AC output inverter. Both work at a high switch-over frequency and are small and relatively light.

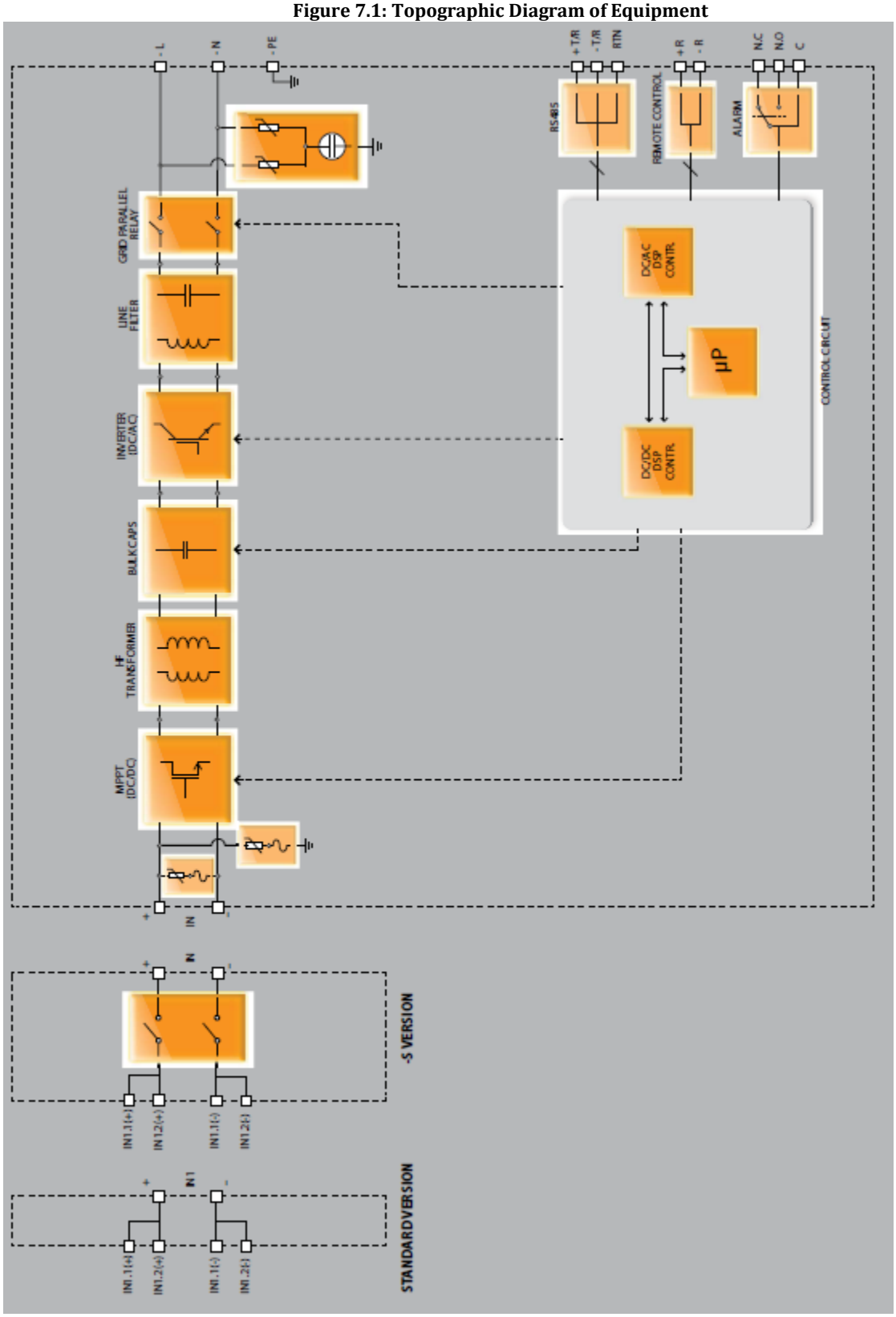
This inverter is equipped with a high-frequency transformer with galvanic isolation of the primary (DC side) from the secondary (AC side), while maintaining very high performance in terms of output and energy export. This type of circuit allows for the grounding of the inputs, both positive and negative, where required by the solar panel type used or by the rules of the country of installation.

The inverter is equipped with a single input converter with Maximum Power Point Tracking (MPPT) to which it is possible to connect two strings of photovoltaic panels. Due to the high efficiency and the large heat dissipation system, a maximum power operation is guaranteed in a wide range of the ambient temperatures without the use of external cooling fans.

The inverter is controlled by two independent DSPs (Digital Signal Processors) and a central microprocessor. The connection to the power grid is kept under control by two independent monitors, in full compliance with the electric field norms both for power supply to the systems as well as security. The inverter is already equipped with all the protections necessary for safe operation and compliance with the norms.

The operating system performs the operation of communicating with the relevant components to carry out data analysis. All this guarantees optimal operation of the entire unit and high efficiency in all insulation and load conditions, always in full compliance with the relevant directives, standards and provisions.

Figure 7.1: Topographic Diagram of Equipment



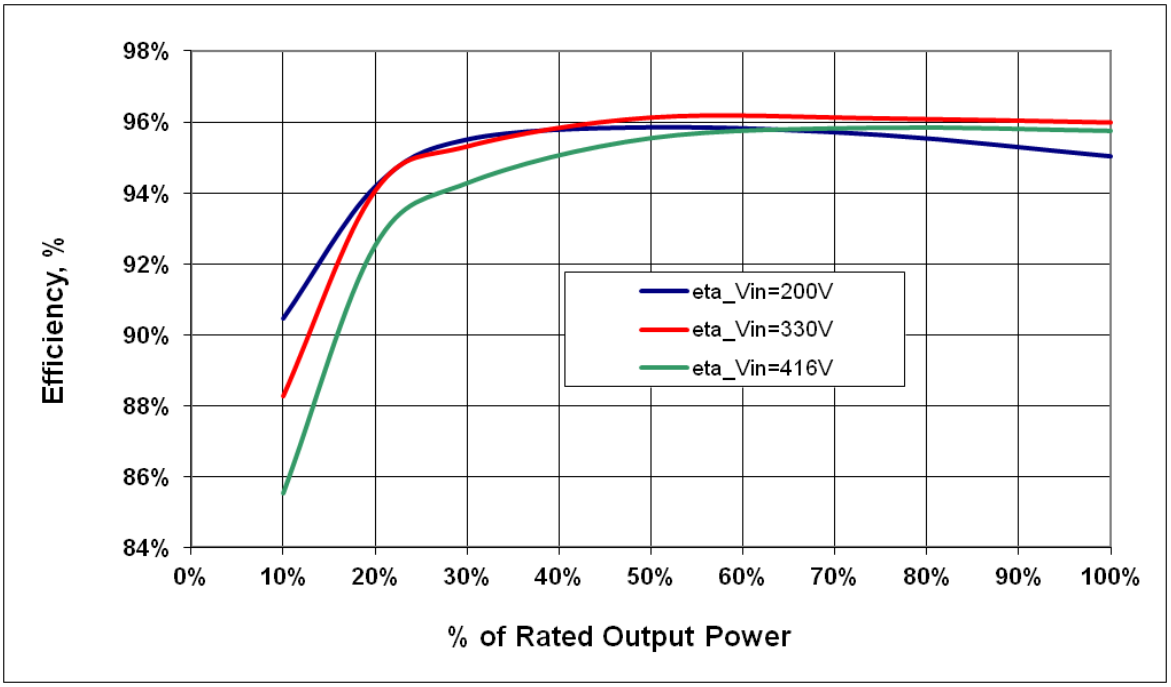
18.5 EFFICIENCY CURVES

The equipment was designed in compliance with energy conservation standards, to avoid waste and unnecessary leakage.
The manufacturer has taken into consideration the current energy saving standards in United States.
Graphs of the efficiency curves of all the models of inverter described in this manual are shown below.
The efficiency curves are linked to technical parameters that are continually being developed and improved and should therefore be considered approximate.
Power Derating Curves over Temperature range -25° to +60°C at 208V ac output:

UNO-2.0-I-OUTD-US 208Vac

CEC efficiency curves, UNO-2.0-I-OUTD-US, 208 Vac grid voltage

% Pout=2000W	eta_Vin=200V	eta_Vin=330V	eta_Vin=416V
10%	90,5%	88,3%	85,5%
20%	94,2%	94,1%	92,5%
30%	95,5%	95,3%	94,3%
50%	95,8%	96,1%	95,6%
75%	95,6%	96,1%	95,8%
100%	95,0%	96,0%	95,8%
CEC Efficiency = 95,5%			

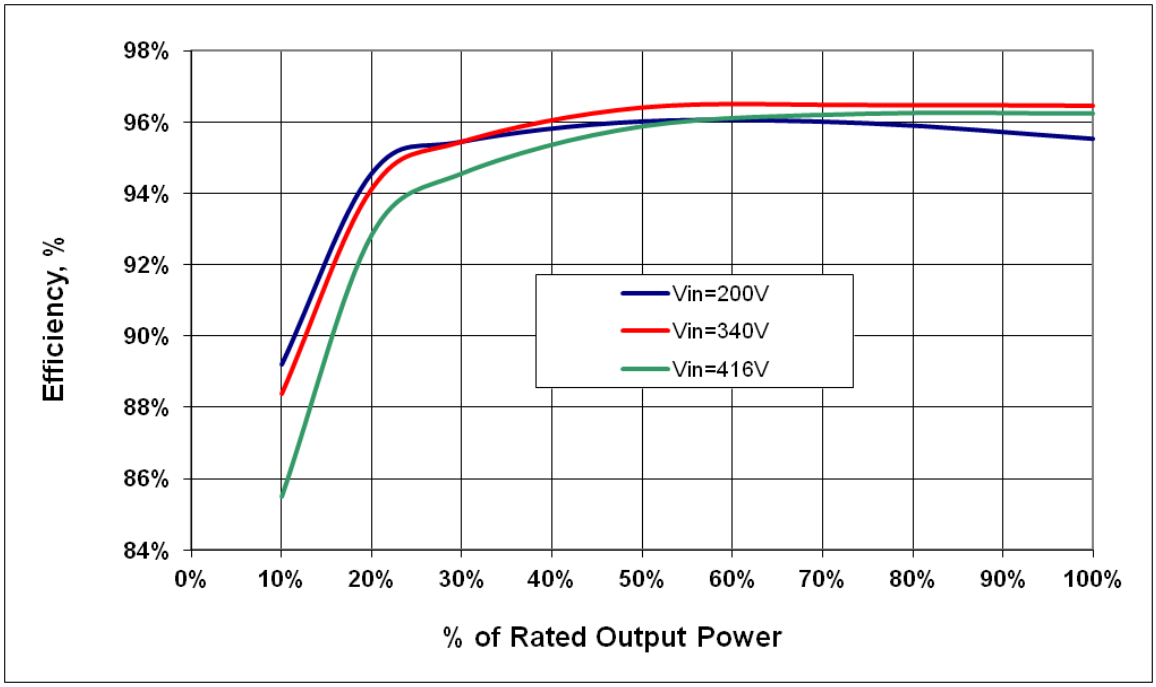


Efficiency curves, UNO-2.0-I-OUTD-US, 208 Vac grid voltage

UNO-2.0-I-OUTD-240Vac

CEC efficiency curves, UNO-2.0-I-OUTD-US, 240 Vac grid voltage

% Pout=2000W	Vin=200V	Vin=340V	Vin=416V
10%	89,2%	88,4%	85,5%
20%	94,6%	94,1%	92,8%
30%	95,4%	95,4%	94,6%
50%	96,0%	96,4%	95,9%
75%	96,0%	96,5%	96,2%
100%	95,5%	96,5%	96,2%
CEC Efficiency = 95,5%			

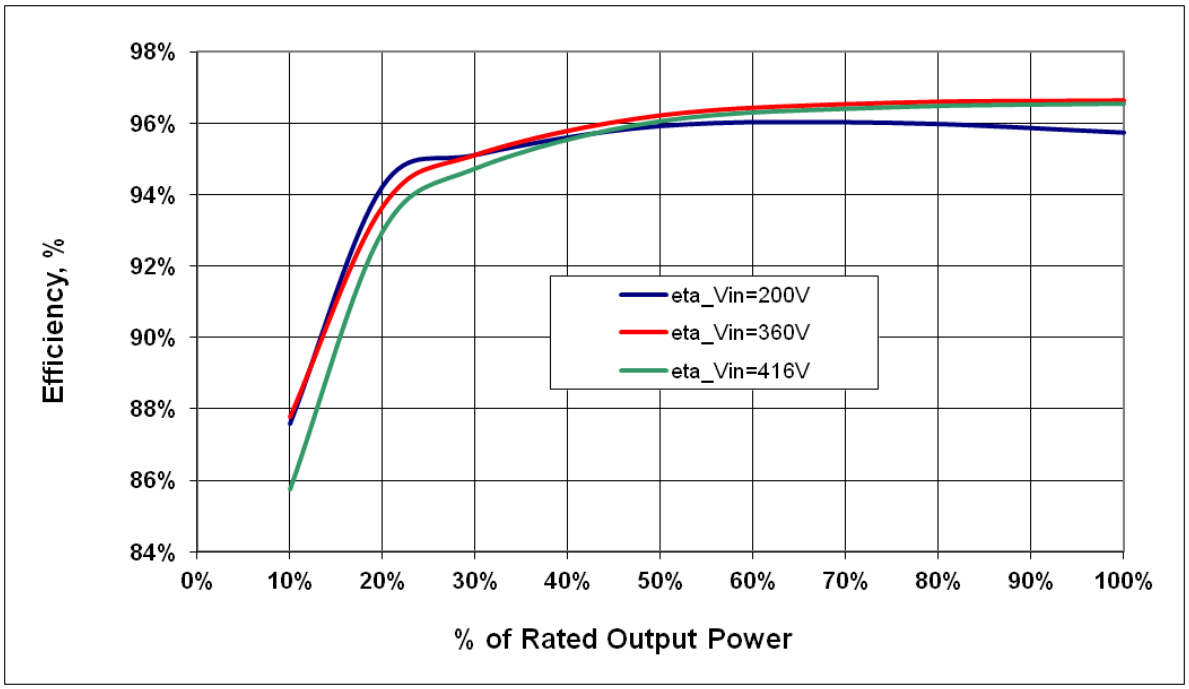


Efficiency curves, UNO-2.0-I-OUTD-US, 240 Vac grid voltage

UNO-2.0-I-OUTD-US-277Vac

CEC efficiency curves, UNO-2.0-I-OUTD-US, 277 Vac grid voltage

% Pout=2000W	eta_Vin=200V	eta_Vin=360V	eta_Vin=416V
10%	87,6%	87,8%	85,8%
20%	94,2%	93,7%	93,0%
30%	95,1%	95,1%	94,7%
50%	95,9%	96,2%	96,1%
75%	96,0%	96,6%	96,4%
100%	95,7%	96,6%	96,5%
CEC Efficiency = 95,5%			

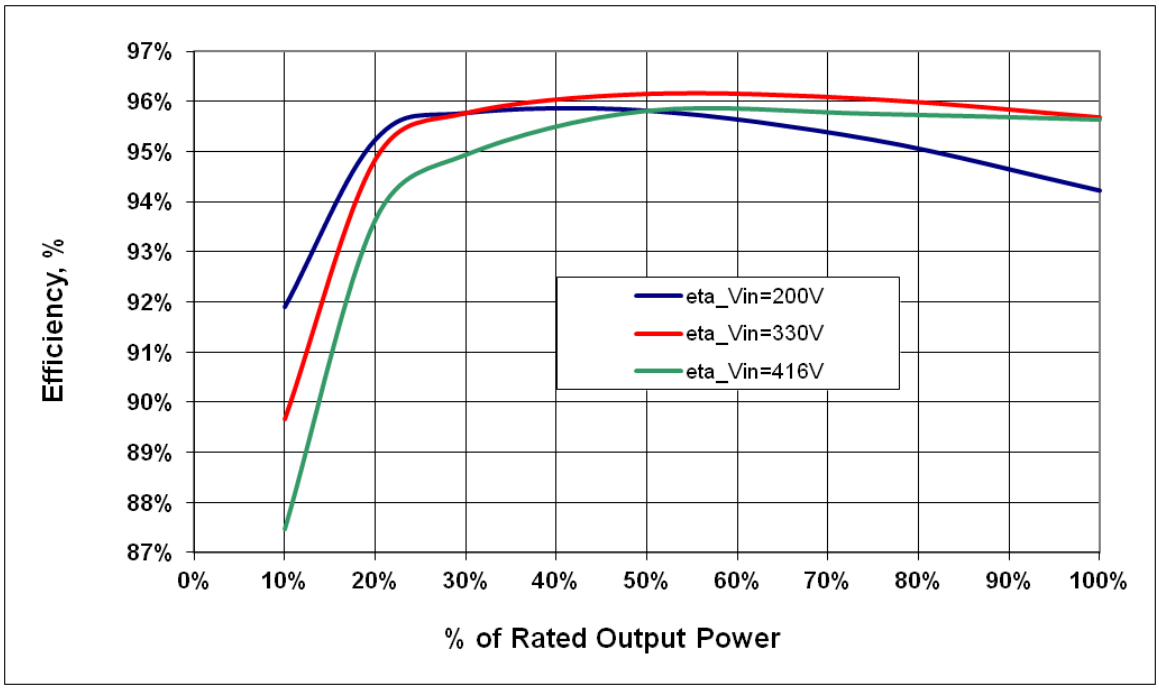


Efficiency curves, UNO-2.0-I-OUTD-US, 277 Vac grid voltage

UNO-2.5-I-OUTD-US

CEC efficiency curves, UNO-2.5-I-OUTD-US, 208 Vac grid voltage

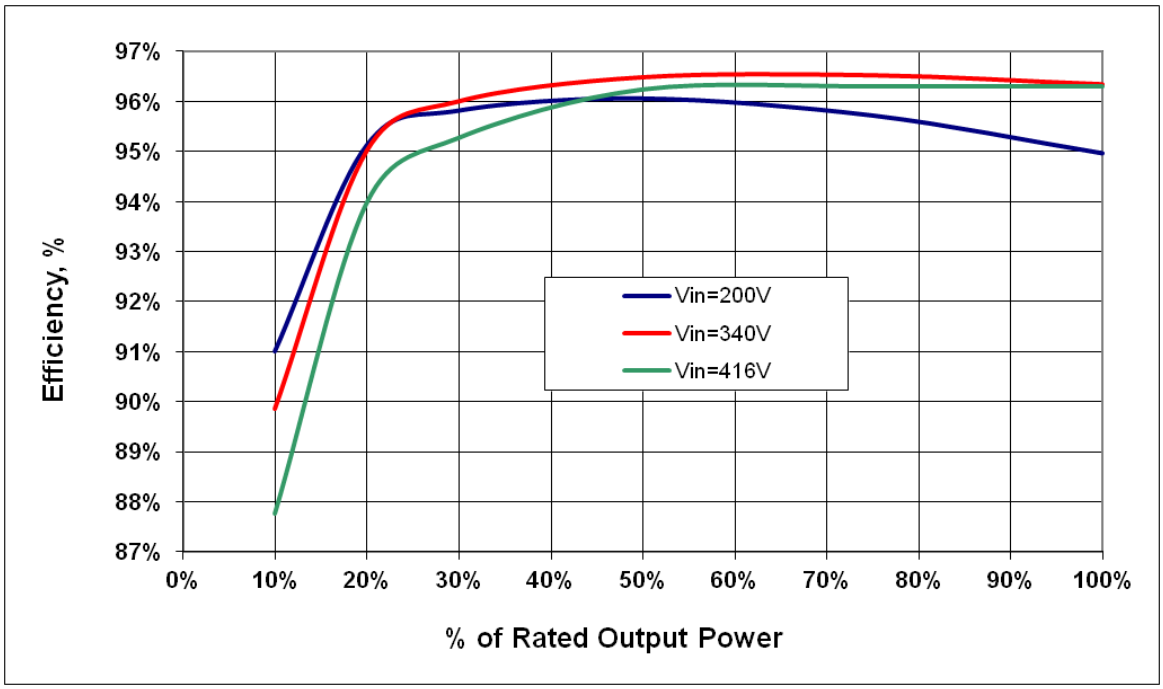
% Pout=2500W	eta_Vin=200V	eta_Vin=330V	eta_Vin=416V
10%	91,9%	89,7%	87,5%
20%	95,2%	94,8%	93,6%
30%	95,8%	95,8%	94,9%
50%	95,8%	96,1%	95,8%
75%	95,2%	96,0%	95,8%
100%	94,2%	95,7%	95,6%
CEC Efficiency = 95,5%			



Efficiency curves, UNO-2.5-I-OUTD-US, 208 Vac grid voltage

CEC efficiency curves, UNO-2.5-I-OUTD-US, 240 Vac grid voltage

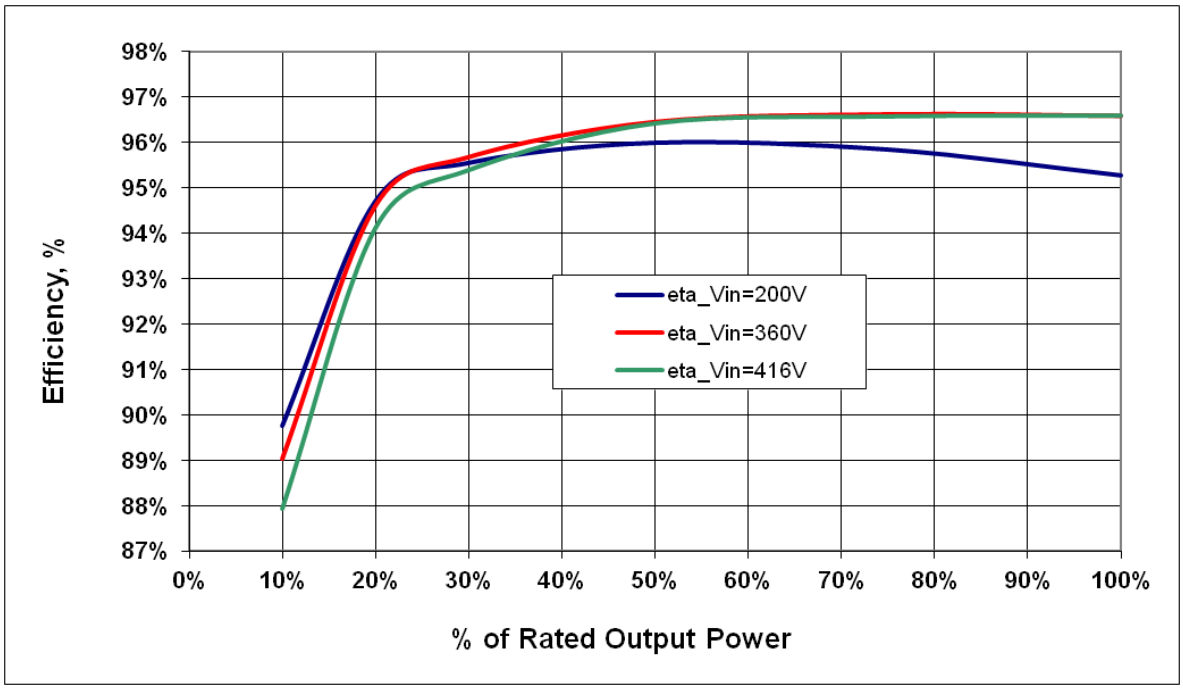
% Pout=2500W	**Vin=200V**	**Vin=340V**	**Vin=416V**
10%	91,0%	89,9%	87,8%
20%	95,1%	95,0%	94,0%
30%	95,8%	96,0%	95,3%
50%	96,1%	96,5%	96,3%
75%	95,7%	96,5%	96,3%
100%	95,0%	96,3%	96,3%
CEC Efficiency = 96,0%			



Efficiency curves, UNO-2.5-I-OUTD-US, 240 Vac grid voltage

CEC efficiency curves, UNO-2.5-I-OUTD-US, 277 Vac grid voltage

% Pout=2500W	eta_Vin=200V	eta_Vin=360V	eta_Vin=416V
10%	89,8%	89,0%	87,9%
20%	94,7%	94,6%	94,1%
30%	95,6%	95,7%	95,4%
50%	96,0%	96,5%	96,4%
75%	95,9%	96,6%	96,6%
100%	95,3%	96,6%	96,6%
CEC Efficiency = 96,0%			



Efficiency curves, UNO-2.5-I-OUTD-US, 277 Vac grid voltage

18.6 A DESCRIPTION OF THE SYSTEM

This equipment is a string inverter that converts direct electric current from a photovoltaic generator into alternating electric current and feeds it into the electric grid.

Photovoltaic panels transform energy from the sun into direct current (DC) electrical energy (through a photovoltaic field, also called photovoltaic generator. In order to use it, it is necessary to transform the type of current into alternating "AC". This conversion, known as DC to AC inversion, is made efficiently without using rotating parts and only through static electronic devices.

In order to allow the inverter to operate in safe thermal and electrical conditions, in the event of adverse environmental conditions or unsuitable input voltage values, the unit automatically reduces the value of the power fed into the grid. This way the solar energy system compensates for the energy drawn from the utilities connected to the grid to which it is linked. The solar energy system therefore powers all connected electrical devices, from lighting to household appliances, etc.

When the photovoltaic system is not supplying sufficient power, the power needed to ensure normal operation of the connected electrical devices is drawn from the national grid. If, on the other hand, excess power is produced, this is fed directly into the grid, so becoming available to other consumers.

In accordance with local and national regulations, the power produced can be sold to the grid or credited towards future consumption, so bringing about a saving of money.

18.7 CONNECTION OF SEVERAL INVERTERS TOGETHER

If the photovoltaic system exceeds the capacity of a single inverter, it is possible to make a multiple connection of inverters to the system, with each one connected to a suitable section of the photovoltaic field, on the DC side, and connected to the grid on the AC side.

Each multi-string inverter will work independently of the others and will supply the grid with the maximum power available from its section of photovoltaic panels.

18.8 NOTES ON THE SIZING OF THE SYSTEM

Decisions about how to structure a photovoltaic system depend on a certain number of factors and considerations to make, such as for example, the type of panels, the availability of space, the future location of the system, energy production goals over the long term, etc.

A configuration program that can help to correctly size the photovoltaic system is available on the ***Power-One*** web site (www.power-one. com).

18.9 POWER DERATING

In order to allow inverter operation in safe thermal and electrical conditions, the unit automatically reduces the value of the power fed into the grid.
Power derating can take place due to adverse environmental conditions or due to unsuitable input voltage values.
The inverter applies power derating based on a number of parameters. Out of all the parameters affecting the power derating of the inverter, the worst-case parameter takes precedence when determining the value of the power derating.

18.10 POWER REDUCTION DUE TO ENVIRONMENTAL CONDITIONS

The inverter can reduce the power during certain periods of the day due to ambient temperatures exceeding the maximum rating for full power operation as specified in the data sheet. The inverter will continue to deliver the maximum available power from the PV string as long as it is less than the derated power.

18.11 POWER REDUCTION DUE TO THE INPUT VOLTAGE

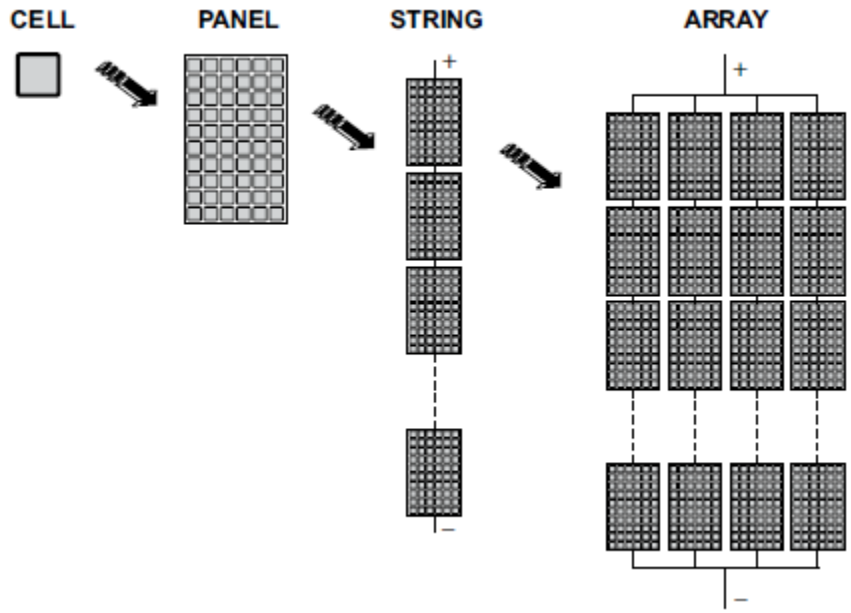
The graphs show the automatic reduction of supplied power when input voltage values are too high or too low.

18.12 CHARACTERISTICS OF A PHOTOVOLTAIC GENERATOR

A photovoltaic generator consists of an assembly of photovoltaic modules that transform solar radiation into DC electrical energy and can be made up of:
Strings: X number of PV modules connected in series
Array: group of X strings connected in parallel

18.13 STRINGS AND ARRAYS

In order to considerably reduce the cost of installing a photovoltaic system, mainly associated with the problem of wiring on the DC side of the inverter and subsequent distribution on the AC side, the **string technology** has been developed. A photovoltaic panel consists of many photovoltaic cells mounted on the same support.
• A **string** consists of a certain number of panels connected **in series**.
• An **array** consists of two or more strings connected **in parallel**.
Large photovoltaic systems can be made up of several arrays, connected to one or more inverters. By maximizing the number of panels inserted in each string, it is possible to reduce the cost and complexity of the connection system of the photovoltaic system.



The current of each array must fall within the limits of the inverter.

To work, the inverter must be connected to the electric grid since its operation can be equated to a current generator that supplies power in parallel with the grid voltage. That is why inverters cannot support the grid voltage (islanding).

###